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On Efficiency.

MUCH is written nowadays about efficiency. As a slogan it is hackneyed; it is a phrase which has been worn almost threadbare. At the same time, however, there was probably never greater need for real efficiency than there is to-day.

Unfortunately, many of those to whom the idea should mean most, seem in effect to regard it mainly as a debating point. They pay lip service to a doctrine, but fail to realise that it involves definite and serious practical application. Almost all concerned affect a belief in efficiency, but here, as often elsewhere, creed and deed may be sundered far. Too many who recognise the need for efficiency, in point of fact consider it as a matter affecting the other fellow.

The management is all too prone to consider that it is only the executive which is to blame for any clogging of the wheels. The executive, oftener than not, alleges outworn methods, and obsolescent, if not obsolete, machinery as the cause. Each is probably right—in part—and as wrong as right. Certainly the management which fails to realise its own responsibility in this matter is heading straight for the rapids. Rebuffs await such a policy—these, and a relegation to the category "has been." The management should realise that it has its own end of the burden to lift. That end, too, is the big end. There must be thorough and periodical overhauling of tools, processes, methods, and programmes. This is no fancy, luxury stunt: it is bed-rock, bone-deep necessity. There is the most urgent need for a far view, a near view, and a keen view. It is imperative to keep in the van of progress so as to compete unimpeded by gratuitous handicap. All this involves constant all-there-ness, most assiduous study, and wisely conceived, well-organised application. Where pains are taken in these particulars, there is of necessity careful planning beforehand as to ways and means. Programmes, however, devised on such lines are never haphazard. They are calculated, well-balanced enterprises, and, given a fair trial, have in them the seeds of success.

Now it is up to the management most of all to devise suitable programmes, to provide the machinery, to discover the ways and supply the means. This involves serious thought, a thorough grasp of the needs of the case, an adequate understanding of the various methods available to satisfy those needs, and the ability to appraise relative values, and to adjudge wisely among alternatives. It demands all this, and a great deal more. In fact, this is but the framework, the scaffolding. Not only must there be the system to work, that system must be worked to the very best advantage. A wise management will not only consider the system as

a thing apart, as a system pure and simple; it will consider that system in relation to the work to be done thereby, and also as related to those who are to use it. These considerations are often of great importance, and frequently of far more consequence than is commonly imagined.

As systems, two or three proposals may be of almost equal excellence, and yet one be greatly preferable to either of the others for one particular class of work, or for one particular body of workmen. The management which does not appreciate such facts has much to learn. A wide-awake alert control will carefully weigh pros and cons, making sure first of all that the data are sufficiently complete whereby pros may be juxtaposed to cons.

Perhaps the one factor which those responsible for the inception and execution of a programme have most of all to keep well in mind is just the human side of the business. The inherently sound and efficient scheme must be worked soundly and efficiently by ordinary workmen. This provides indeed the acid test. If a scheme fails here, be it otherwise never so perfect in conception and design, it fails everywhere. It is a beautiful corpse. The ideal is to provide a programme at once adequate for present requirements and sufficiently elastic to meet future contingencies, to do these things as economically as careful planning and forethought can devise, *and to inspire the hearty co-operation of those who are to work the programme.* It is only when the last provision is met that efficiency becomes an assured fact. More than anything else, success or failure depends upon how the men themselves respond. A moderately effective scheme *per se* can reveal a very considerable measure of success when the human factor functions in the neighbourhood of unity, while a perfect machine may give low output because the human material introduces a very high friction co-efficient. Now the management, where the latter happens to be the case, has need, often enough, of the wholesome corrective of introspection. It is seldom that failure is all due to the other fellow. Friction never arises where only one surface is involved. They who work a scheme, and also they who provide it, are equally concerned—the latter quite as much, if, indeed, not more, than the former. Thus on all counts it is certainly up to the management to do all things possible to facilitate smooth and easy running of a well-designed machine. Fair play, a square deal, scrupulous impartiality; legitimate inducement to real co-operation; an appeal to the loyalties—one loyalty seeking the other: and a genuine stressing of the essential community of interests—these things are not only inherently good things, they are sound payable propositions.

But there must be mutual giving and taking. There cannot be efficiency without reciprocity. So it is up to the operatives to do their bit. On their side of the bargain they do well to insist that their efforts shall not be exploited. Naturally if they produce better, and substantial benefits accrue to the company thereby, they expect some proportionate return. Where, however, such a principle be accepted, and an honest attempt be made on each side to deal fairly, in effect there is at least an embryo co-partnership. If success, however, is to be really assured, the workers themselves must do their part loyally, even enthusiastically. Once they realise that their efforts count, that the work they do is appreciated, that they themselves really participate in the progress they help to make, those worth their salt will work both hard and well and with added interest in what they do.

In the nature of things there is no inherent reason why management and executive should not work together in willing, even cordial, co-operation. They are team horses between one pair of shafts: they are partners in one concern. They are fellow mortals, or immortals. Their main interests in home, wife, and family in general run on all fours. Outside the company's premises they have, many of them, in many things, kindred tastes and like pursuits. Why should they not come to respect each the other, to understand that mutual helpfulness *within the works gates* is a good thing and, on the whole, a paying proposition? It is—if there is mutual confidence and mutual respect, and a concerted effort. So-called class distinction, or class-consciousness, breeds suspicion and all the evil brood which saps the nation's strength and hinders the nation's prosperity. It is suicidal; it is fractricidal.

Efficiency is ever the outcome of harmonious and effective effort. It needs that those organising and those executing the work carry it through with skill and in accord. Management and executive each contribute their quota; and success rewards the organisation where these things are the rule and not the exception. But, above all else, the human element must be studied, and the human effort stimulated.

Electricity Supply in Germany.

It is stated that at the present time development is proceeding at such a pace in the electricity supply industry in Germany as to cause managers some concern as to the possibility of fully meeting the demand; this has been particularly the case since the stabilisation of the currency. It has been pointed out in a German newspaper by Dr. Hamm, of Charlottenburg, that, although the increase in the demand of from 10 to 25 per cent. in 1924 was comparatively inconsiderable, the current year has brought about an advance amounting to 50 per cent. on the average. This growth, however, has not been accompanied by a corresponding increase in the receipts, as sale prices have been largely and repeatedly reduced, and the additional income often bears little relation to the greater production. On the other hand, the expanding demand necessitates extensions of plant and networks, for which it is difficult to find the funds. In the circumstance, many of the undertakings look forward with apprehension to the winter, with its inevitable maximum loads, as very few undertakings have been able to extend their plant and networks sufficiently. As most works were only able to enter into contracts for the supply of additional plant in the spring or summer of this year, it will be impossible for the new machinery to be brought into service until the winter of 1926-27, and it is therefore not impossible that "rationing" may have to take place in some districts this winter. In interested circles it is calculated that the consumption will be doubled or trebled in the next few years.

Although the general production of electricity throughout Germany has greatly increased, the number of stations has diminished, as the smaller areas have found it advantageous to obtain supplies from the large and more efficient works rather than to generate on their own account. On the other hand, says Dr. Hamm, the extension of hydro-electric works has not always been very prudent; in the case of the East Prussian works, it has been necessary to duplicate the whole of the machinery, as the water power can only be used during a part of the year.

With reference to the increasing use of crude lignite as fuel, it is stated that, while about 70 per cent. of the total production of energy in 1913 was based upon the combustion of pit coal, the percentage fell to 40 in 1924. Actually, however, the quantities have naturally increased; thus the 70 per cent. of the year 1913 corresponds to 2,800,000 000 kWh, while the 40 per cent. of 1924 represents 4,600,000,000 kWh. But the author considers that this movement will probably again take a downward course, as the lignite resources of Germany, particularly those of Central Germany, will only suffice for a certain time. The technical improvements which are being developed will cause pit coal again to come to the forefront as fuel.

The charges for energy are far below those prevailing in 1913. On the other hand, the costs of production in favourable cases are at the former peace time level, but they are frequently much higher so that the financial results of the works do not correspond with the largely increased output. Large consumers in particular are charged prices which, it is said, scarcely cover the cost of production.

In conclusion, Dr. Hamm states that the plant capacity installed in German electricity works in 1924 was 5,350,000 kW, of which 725,000 kW represented water power, 1,830,000 kW lignite stations, and 2,530,000 kW using pit coal. The stations in operation at the end of 1924 comprised 2,068 in private ownership and 1,094 in State or municipal hands. As to the size of the generating stations, in 1913 there were only 13 of a capacity of 20,000 kW and over; at the present time the number is 80, and the capital invested in the power stations, excluding the distribution systems, is put at 1,100,000,000 marks.

London's Electricity Supply.

CONTINUING our comments on the London County Council's Return, to which we referred in our last issue, we note that the aggregate output (sold) of the municipal undertakings within the County was 257 million kWh, and the total revenue was £2,436,713; the output of the companies was 413 million kWh, and the revenue £5,194,477.

From the foregoing figures it will be seen that the municipalities supplied 0.38 of the electricity used in London for 0.31 of the revenue, and the companies supplied 0.62 for 0.68 of the revenue; the average price charged by the latter, therefore, as previously mentioned, was 40 per cent. higher than that charged by the former. The incidence of the figures varies very widely in both cases, as an inspection of the results will indicate. Allowance should be made for the nature of the consuming public in each individual instance; for example, in Kensington the load is mainly lighting, whilst Stepney has a large power load. The average load factors, however, differ but little, being 22.5 per cent. for the Councils and 20.5 for the companies.

For some time correspondence has been proceeding in *The Times* regarding the high prices charged in the City of London, as compared with those offered by municipal undertakings in adjoining boroughs. In the City the conditions are not similar to those obtaining in Stepney and Poplar, where there is an industrial demand, and the lighting hours are longer; the load factor of the City undertaking of the Charing Cross Company last year was 21.5 per cent. and that of the City of London Company only 14.4, whilst that of Stepney was 28.8 per cent. The average rate of interest and dividends paid by the Charing Cross company was 6 per cent. for the year; adding to these payments the amount put to reserve, the total was 11½ per cent. on the capital—a good return, but hardly exorbitant. In the case of the City Company the average rate was nearly 9 per cent., and the total, including reserve, 16 per cent., which is certainly an unreasonably high rate of profit, representing 1.6d. per kWh sold. Now that the fear of 1931 has been removed, the companies will have no excuse for paying large sums to reserve, and as they will come under the sliding scale of prices and dividends, these matters will be settled automatically in future.

The case of the County of London Company is less excusable. With a capital called up of £4,055,000, the average rate of interest and dividends was 8.71 per cent.; the revenue was £1,023,493, and the total expenditure only £370,450. The amount available for distribution was £803,192, or no less than 2.45d. per unit sold, and after paying £355,772 in interest and dividends, the large sum of £491,316 was transferred to reserve, bringing that fund up to £1,705,247. The profit surplus thus amounted to no less than 21 per cent. on the capital.

The Operation of Inter-connected Undertakings.

WHILST there are limits to the advantages to be derived from the inter-connection of generating stations, depending upon the distance between them and the cost of the transmission line, there is no doubt that when the distances are short, very substantial economies can be effected by linking up. These benefits, however, cannot be fully realised unless the load is divided between the respective undertakings to the best advantage. In the case of such a system as that of the North-East Coast Companies, this end is attained by placing the whole of the stations and mains under the direction of a load controller, who is kept fully informed regarding the conditions obtaining in each area.

Where the undertakings are not owned by a single authority, the problem is not so simple. Apart from emergency requirements, such as the breakdown of a generating set at a fully loaded station, which would at once be met without regard to economic considerations, the question is how to regulate the output of the respective stations so as to secure the maximum commercial efficiency. In the *Electrical World* recently Mr. S. Ferguson, president of the Hartford (Conn.) Electric Light Company, explained the method of co-ordination adopted by three interconnected companies of which his own was one. An "Exchange Board" was set up comprising one representative from each company, and a manager was appointed by the Board of co-ordinate daily and hourly the load dispatchers of the three companies. The manager's function was to buy energy for the Board from any company at the lowest possible price at which it could be given at any hour without actual monetary loss—*i.e.*, at its then increment of fuel costs, depending, of course, on the state of the load at the time; at the same time, he sold it to one or both of the other companies, the sale price being again the increment cost. In this way neither the seller nor the buyer benefited financially by the transaction, but all ultimately shared in the economy through the medium of the Board at a monthly settlement.

Electric Washing Machines.

IN this issue, as in our last, we publish some notes and pictures of washing machines to give our readers some idea of the numerous models which are available both here and in the United States. As we have said already, the existence of such a large market for these machines in America seems a sufficient reason for supposing that there are great opportunities in this country. In fact, we may go so far as to say that there is already a fairly good sale for these machines. It may surprise readers to learn that one firm in this country has sold over 6,000 of its electric washers and is still disposing of them at the rate of from 20 to 30 a week. Another company informs us that last year it sold 540 washing machines. It is evident, therefore, that a demand exists; it only remains to be seen how best it can be cultivated. Most people to whom the question of washing machines is mentioned immediately point out the disadvantages of these appliances. It is a common thing for articles beyond the reach of our pockets to be considered in this light. A motor-car, for instance, requires garage space, tires are an expensive item, the engine is always needing taking down, and so forth. Similarly, we think that a great deal of the antipathy (and apathy) displayed towards washing machines is traceable to their cost. In the United States this has been met to a great extent by the adoption of hire-purchase systems, but there is no doubt that something more than this is necessary in Great Britain. It is useless to point to the saving of labour or laundry charges effected by the machines, if their price is too high. The clothes are not finished with when they leave the washer; several operations still remain to be done. Labour saving is a great point—in fact, *the* point—of the electric washing machine, but perhaps labour can be saved at too great a cost. It is surely not beyond the powers of our people to devise a machine which will cost the public about a half or even a quarter of the price at which most electric washers are now sold. The "Gaslectric" machine described in our last issue seems to be a step in the right direction as regards both cost and convenience.

Electric Washing Machines.—II.

In our last issue we illustrated and described a number of washing machines which are upon the British market, but we omitted one machine which has gained a certain measure of popularity in this country—the "Thor," which is illustrated in fig. 10, and is supplied by the Hurley Machine Co. This has a reversing revolving

Fig. 10.—The "Thor" Washer.

cylinder driven by a 0.25-h.p. B.T.-H. motor. All the driving mechanism is totally enclosed, and thus all danger is eliminated. A friction drive is provided, so that any overload which may occur immediately stops the machine. The means of control are simple—a single switch and two levers, one for the cylinder and the other for the wringer. The latter consists of a pair of 11-in. cushioned rollers. The machines are made in a number of sizes ranging from that suitable for a small flat to a machine designed for institutions.

The Hotpoint-Aerobell washing machine (fig. 11), made by the Hotpoint Electric Appliance Co., Ltd., was also omitted from our last issue. This washer has a reciprocating-revolving shaft bearing vacuum cups. The motor and driving gear are entirely enclosed and an efficient lubrication system is embodied in the machine. The cylinder is made of copper, and the container is also of copper, tinned inside and highly polished outside. The washer is capable of dealing with eight full-sized sheets.

In this part of the article we propose to introduce our readers to a number of American patterns, which, it will be seen, vary greatly in construction and operation.

The "White Lily Ace" washer, illustrated in fig. 12, is of simple design, consisting of a wood or copper tub mounted on a movable framework. This has a capacity of eight full-sized sheets and the "agitator" and wringer are of aluminium.

Fig. 13 illustrates an entirely different pattern. This machine—the "Klymax"—operates on the vacuum cup principle. There are three cups mounted on a central arm; these are given a reciprocating motion, up and down, and are claimed to suck the dirt from the clothes. The cups operate in a perforated cage, which is arranged to run at high speed, so that when the clothes are washed they can be placed in this cage and dried on the centrifugal principle. The machine is usually provided with a gas heating arrangement for the water. There is a direct flexible shaft drive, and the moving parts work on ball bearings. The motor is only of 0.25 h.p.

The "Haag Vortex" machine, fig. 14, is also of a novel pattern, consisting of a metal tank, below which is mounted the motor and enclosed driving gear, the latter operating a dolly fixed in the centre of the tank. This dolly has four wings which have a beating action upon the clothes. An auxiliary shaft passes from the driving gear into a small gear box mounted on the top of the tank from which the wringer is driven.

The fourth example (the "Whirldry," fig. 15) is another machine on the centrifugal system. From the illustration it will be seen that in the upper part of the tank is a rotating cage containing a four-winged dolly. When the washing operation is completed the level of the water is allowed to fall or the tank is drained, and the cage is run at a high speed to extract the moisture from the clothes.

The "Gainaday" washer, depicted in fig. 16, is of the rotary container type with the motor and driving gear entirely enclosed, including the auxiliary gear at the top of the tank which drives the wringer. This machine is of a very compact nature and handsome in appearance.

The "agitator" principle is employed in the "Horton" machine, illustrated in fig. 17, the agitator being a central dolly with three vanes made of cast aluminium, which is claimed to produce a speedy washing action. It is mounted in the top of the tub. The motor and gear, as shown, are well enclosed. It will be noticed that in most of these machines the wringer gear is of the same type, *i.e.*, an auxiliary shaft operating a right angle drive in a small gear box mounted at the top of the tank. The interior of the tub in this machine is nickel plated, and the outside highly polished.

Another vacuum-cup machine is the "Trojan," fig. 18. In this the cups not only reciprocate, but they also slowly revolve, the motion being provided by an eccentric gear operating the central shaft. A tripod stand on castors is provided; the tank is of metal, and the usual form of wringer drive is incorporated.

In the "G.R.S." electric washer (fig. 19) is a revolving aluminium cylinder which reverses its direction at each few revolutions. The cylinder is contained in a

Fig. 11.—The "Hotpoint-Aerobell."

square tank; the gear is heavily protected and the wringer can be swung in any direction.

Fig. 20 depicts a very ornate machine, produced by the Coffield Washer Co. In this a reciprocating cylinder is mounted in an outer container built mainly of aluminum, which is highly finished. This machine is not only of great utility; it is also a handsome piece of furniture.

Of a somewhat different nature is the machine illus-

Fig. 12.—The "White Lily Ace" Washer.

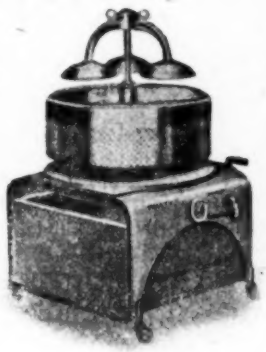


Fig. 13.—The "Klymax."

Fig. 14.—The "Haug Vortex."

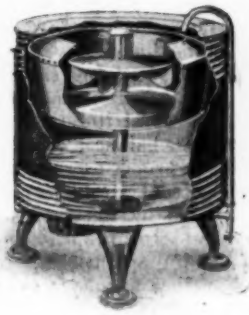


Fig. 15.—The "Whirldry."

Fig. 16.—The "Gainaday."

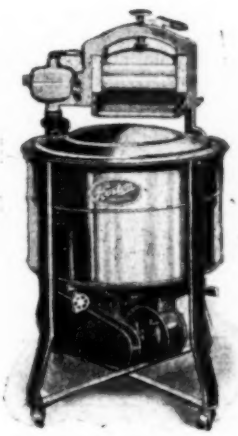


Fig. 17.—The "Horton."

Fig. 18.—The "Trojan."

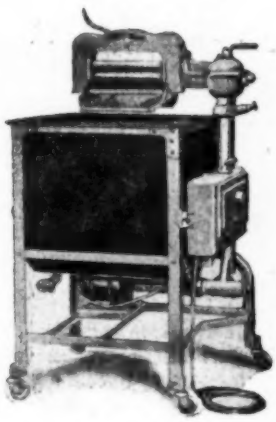


Fig. 19.—The "G.R.S."

Fig. 20.—The Colfield Washer.

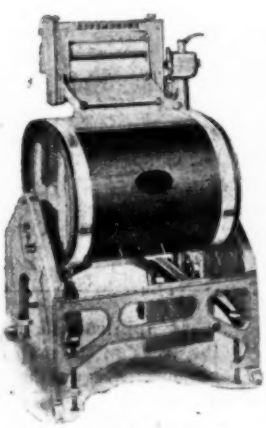


Fig. 21.—The "Prima."

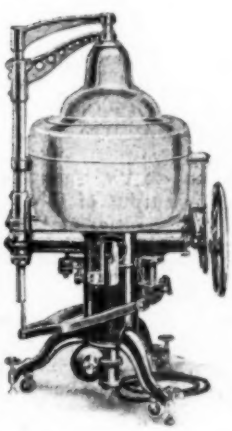


Fig. 22.—The "Bock."

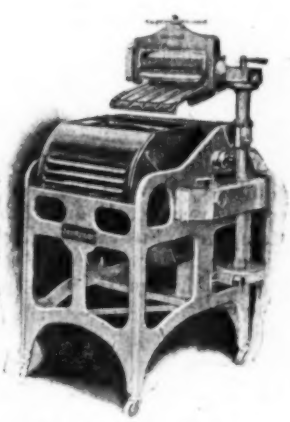


Fig. 23.—The "Sunnysuds."

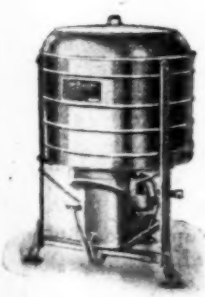


Fig. 24.—The "Laundryette."

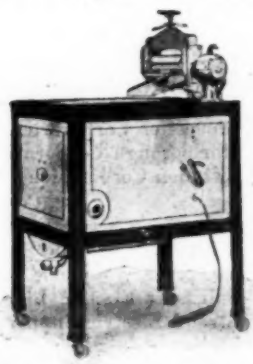


Fig. 25.—The "Double A."

Fig. 26.—The "Federal."

Fig. 27.—The "Fem" Washer.

Some Examples of American Washing Machines.

trated in fig. 21—the "Prima" washer. This consists of a plain tub mounted on gimbals which has a spring-loaded reciprocating motion. The wringer is mounted on a separate rigid post, through which the auxiliary driving shaft is taken.

The "Bock" machine, shown in fig. 22, is built on rather novel lines. It operates upon the principle of dynamic balance, which permits a speed of 1,750 r.p.m., for the proper extraction of moisture, without vibration. The actual washing is done by a reciprocating dolly actuated by the gear seen clearly in the illustration. The wheel at the right-hand side performs the necessary switching operations.

Another washer of the cup type is the "Sunnysuds," depicted in fig. 23. The cabinet is cut out to procure lightness and the tub is given a reciprocating motion, and, moreover, a "washing board" effect is obtained by a series of long horizontal indentations in the sides of the container. The usual swinging wringer is fitted, and the motor is mounted on a shelf immediately below the reciprocating tub.

Fig. 24 shows the "Laundryette" machine, in which the totally-enclosed motor is hung from the top frame, facilitating replacement. As will be seen, all the moving parts are effectively enclosed, and the machine is said to work absolutely without noise owing to the type of drive fitted—a silent pinion on the friction wheel hub and a specially-designed bronze slide on the backshaft. The drive from the motor to the central spindle is by belt.

A cut-away view of the "Double A" washer appears in fig. 25. This machine has an inverted dolly which operates at the bottom of the container. The usual form of wringer drive is fitted, and the motor is started and stopped by the lever seen in the left of the illustration. An automatic oiling arrangement is one improvement incorporated in this machine.

The "Federal" washing machine depicted in fig. 26 is characterised by a serviceable appearance. It is an oscillating-cylinder model, and the driving motor and wringer shaft are enclosed in the casing of the body, making the machine one of the safest to operate among all the types here illustrated.

The "Fem" machine, illustrated in fig. 27, employs a perhaps unique arrangement. The clothes are held motionless between two screens while the water is forced up and down by a piston which is operated by the motor mounted on the top of the copper tank. The machine has only one small gear wheel, which is enclosed in a housing.

In concluding this article we desire to express our acknowledgment to *Electrical Merchandising*, from whose advertisement pages some of the illustrations have been reproduced.

Electricity Supply in Great Britain.—VIII.*

Gloucestershire and Wiltshire.

Nearly all of Gloucestershire and more than half of Wiltshire are included in the Lower Severn Electricity District as provisionally determined by the Electricity Commissioners, and, with the exception of the Salisbury Electric Light and Supply Co., Ltd., all the other authorised undertakers in the list below are concerned with this District.

In this connection it is interesting to note that the Electricity Commissioners' Fifth Annual Report mentions that the stage is approaching when the question of the reorganisation of supply in this District will need to be reopened.

We also wish to draw attention to the remarkable similarity between the increase in output of this District (Area No. 1) and that of the counties of Dorset, Hampshire, Sussex, &c. (Area No. 19), which we have recently dealt with in this series. The figures are taken from Table 8 of the Electricity Commissioners' annual pamphlets, "Generation of Electricity in Great Britain."

Year ended March 31st.	kWh generated. Area No. 1.	Area No. 19.
1922 ...	77,943,016	76,313,651
1923 ...	89,456,059	88,869,613
1924 ...	105,394,934	104,884,274
1925 ...	119,257,004	120,094,019

The northern part of this District is a typical example of the chaotic conditions at present confronting the Commissioners. The Rural District of Tewkesbury (Glos.), for instance, has been applied for by three different undertakers. The frequencies of their systems are 25 cycles, 50 cycles, and 100 cycles respectively.

The undertaker with the 25-cycle system has just been granted statutory powers, under Section 17 of the Schedule to the West Midlands Electricity District Order, 1925, to supply electricity for all purposes in the part of Worcestershire included in the Lower Severn Electricity District, and in the detached parts of Worcestershire (Nos. 3 to 7 inclusive), as well as in certain parts of the Counties of Salop and Stafford.

The following table gives particulars of the above and other areas for which competing applications have been lodged:—

Name of authorised undertaker.	System of supply.	Areas for which competing applications have been lodged. Tewkesbury R.D. (Glos.)	Winchcombe R.D.	Gloucester R.D.	Cheltenham R.D. (part)
—	—				
Shropshire, Worc. & Staffs. E.P. Co.	A.C. 25 ~	×	×	—	—
West Glos. Power Co., Ltd.	A.C. 50 ~	×	—	×	×
Cheltenham Corporation	A.C. 100 ~	×	×	—	×
Gloucester Corporation	D.C.	—	—	×	—

× = Application lodged.

No applications have yet been lodged in respect of the areas on the map on the opposite page which are not hatched, nor do they belong to any authorised undertaker.

The following is a list of the authorised undertakers whose areas of supply are wholly or partly included in the map:—

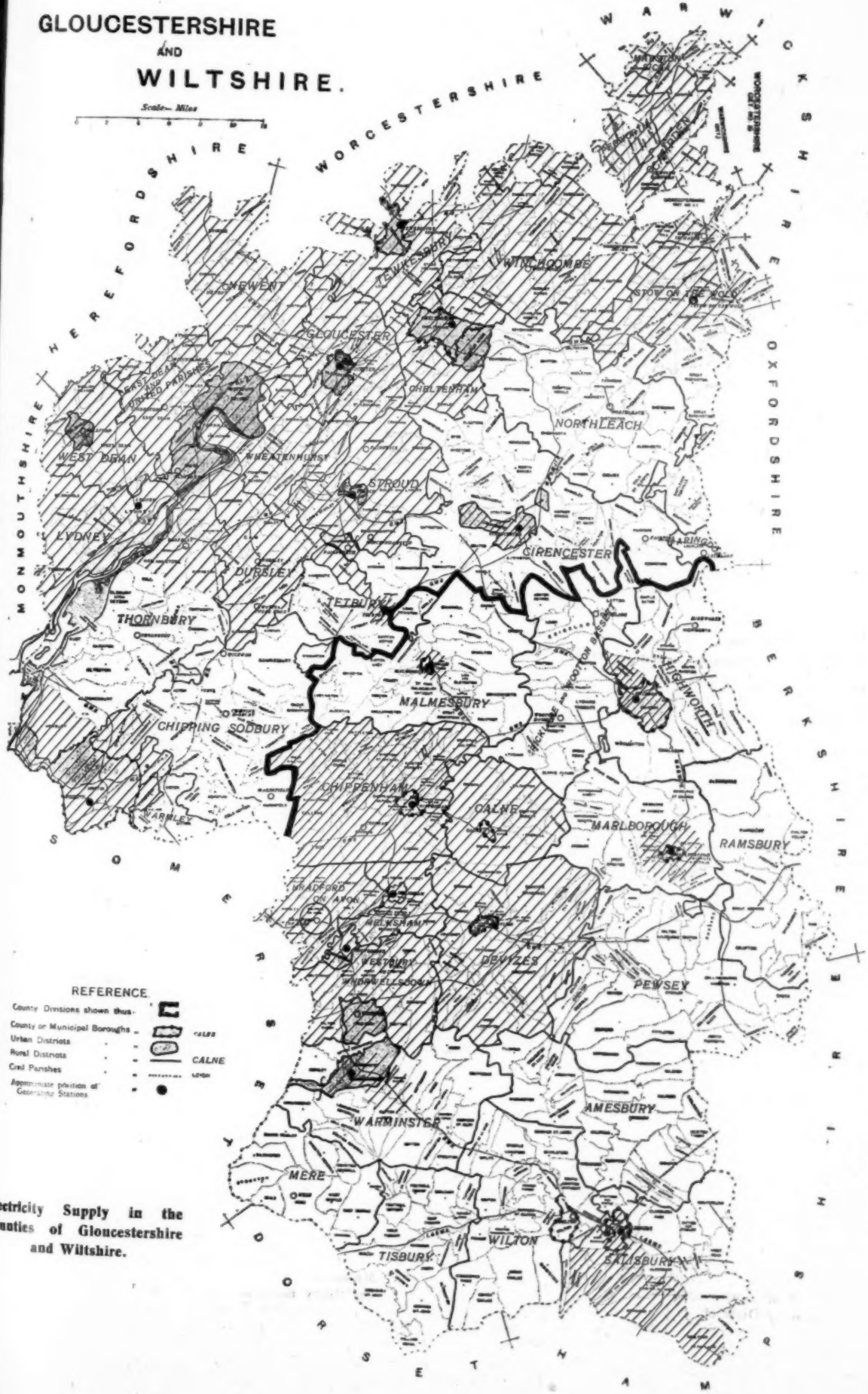
Local Authorities.

Bristol Corporation.
Calne Corporation.
Cheltenham Corporation.
Gloucester Corporation.
Marlborough Corporation.
Swindon Corporation.

Companies.

Chepstow Electric Lighting & Power Co., Ltd.
Cirencester Electric Supply Co., Ltd.
Malmesbury Electric Supply Co., Ltd.
Salisbury Electric Light and Supply Co., Ltd.
Stroud Electric Supply Co., Ltd.
Tetbury Electric Supply Co., Ltd.
Tewkesbury Electric Light Co., Ltd.
Warminster Electric Supply Co., Ltd.
West Gloucestershire Power Co., Ltd.
West Wilts Electric Light & Power Co., Ltd.

* Parts I-VII of this series appeared in the Electrical Review of October 9th, 16th, 23rd, and 30th, November 13th and 20th, and December 11th, 1925.



Electricity Supply in the Counties of Gloucestershire and Wiltshire.

The 1921 Census gives the following particulars for the Administrative Counties of Gloucestershire and Wiltshire and the associated County Boroughs:—

Acres.	Persons	Resident families.	Buildings not containing dwellings.
1,669,943	1,049,859	252,355	16,130

The map is reproduced from those prepared for the 1917 Boundary Commission, by permission of the Controller of H.M. Stationery Office.

In order to bring the map topographically up to date, a list of alterations made since 1917 is given below:—

(1) The County Borough and Parish of Bristol has been enlarged by the inclusion of parts of the Parishes of Thornbury and Easton-in-Gordano.

(2) The Parish of Downton has been divided into two new parishes, called the Parish of Downton and the Parish of Morgan's Vale and Woodfalls.

(3) Parts of the Parishes of Upper Swell and Maugersbury have been added to the Urban District and Parish of Stow-on-the-Wold.

(4) Part of the Parish of Tetbury Upton has been added to the Urban District and Parish of Tetbury.

(5) The Parishes of Marlborough Saint Mary, Marlborough Saint Peter and Saint Paul and Preshute Within have been united to form the new Parish of Marlborough, co-extensive with the Borough of Marlborough. The Parish of Preshute Without has been re-named the Parish of Preshute.

NOTE.—With reference to alteration (2) it will be seen that the whole of the Parish of Downton as shown on the map has been hatched, although the Parish of Morgan's Vale and Woodfalls is not mentioned in the description of the area applied for as set out in the London *Gazette* of May 22nd, 1925, page 3,463.

A Unique Electric Sign.

Some Particulars of the Huge Colgate Sign.

WHAT is claimed to be the largest electric sign in England, the new one recently erected on the south bank of the Thames, between Charing Cross and Westminster Bridge, to advertise Colgate's toilet productions, presents some particularly interesting electrical and mechanical features. It covers a vertical area of 5,000 sq. ft., and is carried on a steel frame quite independent of the building in front of which it is erected. The frame, which weighs over 60 tons and is of a very elaborate design, to sustain the various stresses of wind pressure, &c., is carried on four 9-in. × 11-in. steel stanchions; these stand on concrete bases, each having a volume of approximately 300 cu. ft. The words

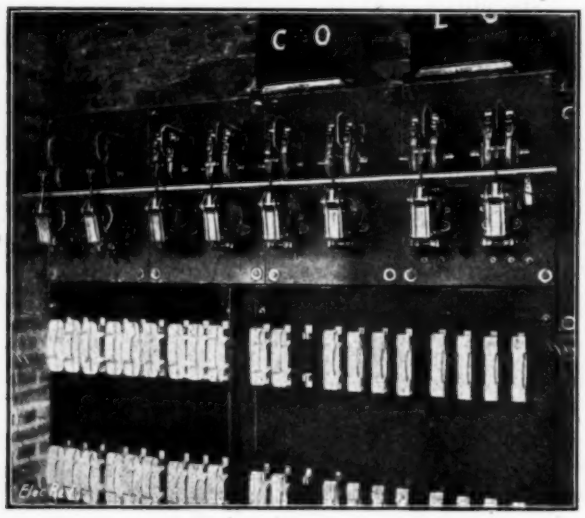


Fig. 1.— Large-Letter Control Gear.

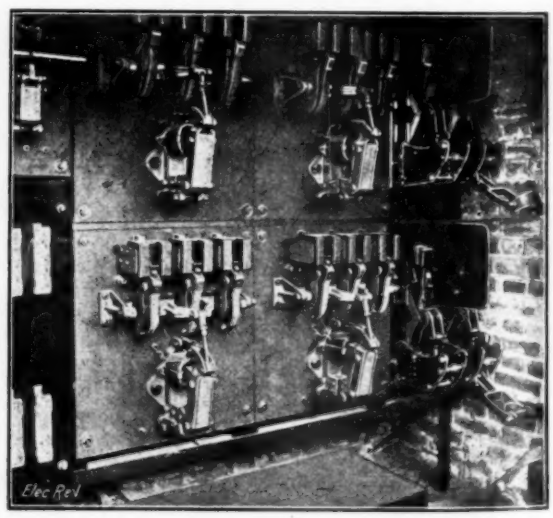


Fig. 2.—Main Breakers and Contactor Switches.

"You'll Come To Colgate's By Degrees," and a thermometer, 60 ft. high by 12 ft. wide, which records the correct temperature at all times, are portrayed by night and day. The large letters (Colgate) are 12 ft. 6 in. high, and average each a weight of a quarter of a ton; the smaller letters are 5 ft. high. All of them are constructed of white vitreous enamelled steel, giving a good visibility during the daytime and an excellent distinction when illuminated at night. The loading of the sign is approximately 100 kVA. The supply is received from the London Electric Supply Corp. at a pressure of 2,500 V, and is reduced to a working pressure of 105 V by two 50-kVA transformers on the site. The general installation is made up in two sections, which are protected by two 2,000-A d.p. breakers, fig. 2, right. Each section is controlled by a pair of 1,000-A contactor switches, fig. 2, which are governed by a Venner time switch. Each of the larger letters is operated by a small d.p. contactor switch, fig. 1. The lighting of the smaller letters and the mercury column is arranged to be intermittent and these with the small contactor switches are operated direct by a rotary flasher, fig. 3. This is built up in five sections, each section being controlled by a separate brush switch. The flasher is operated through spur gearing by a small a.c. motor, and is contained in a sheet-metal case at the foot of the control board, figs. 1 & 2. The flasher is so adjusted that at no period is the sign completely out.

The main feature of the sign is the visible thermometer, which is shaped to represent a huge "tube" of dental cream. It is constructed of sheet steel, with raised opalite figures and degree spacers illuminated from the back. The mercury medium is represented by a central white column. From the top of the "thermometer" is suspended a black "apron" covering the upper portion so that the height of the remaining part indicates the temperature as measured by an electrical resistance thermometer mounted close at hand. The "apron" is raised or lowered as the temperature varies, by means of a small d.c. motor housed in the top of the "thermometer." The control apparatus for this motor consists of an ingenious system of electrical relays governed by a regulating device in the form of a Wheatstone-bridge circuit, in which the coil of the electrical resistance thermometer forms a part of the "unknown-resistance" arm. The other three arms are made of a material the resistance of which is not affected by

changes in temperature. A slide-wire resistance is placed between the "unknown" and the "variable" arms, and the final balance is obtained by means of a moving contact. The "bridge" circuit is energised by a 1.5-V battery, and a moving coil galvanometer is connected across the "bridge" in the usual manner, the moving contact on the slide wire resistance making one terminal. The galvanometer coil is suspended between the upper poles of two vertical bar magnets. An aluminium pointer is attached to the galvanometer coil, and carries at its extremity two small thermo-couples T_1 and T_2, fig. 4, which are connected electrically to a moving-coil relay. The latter is placed between the bottom poles of the vertical bar magnets. An electrically-heated spiral H, fig. 4, almost embedded within a metal block, so that the heat is

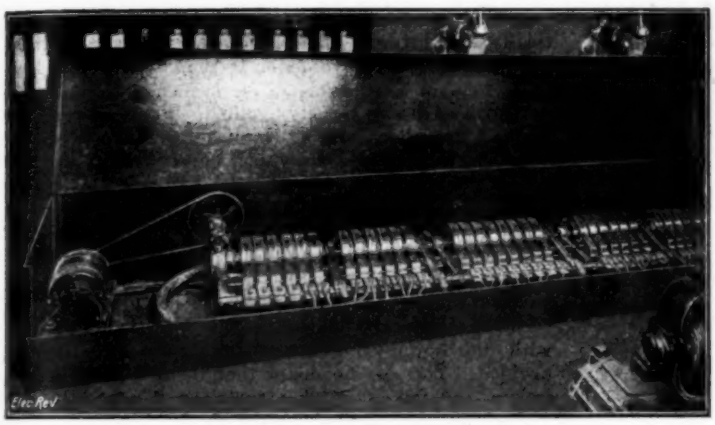


Fig. 3.—Rotary Flasher.

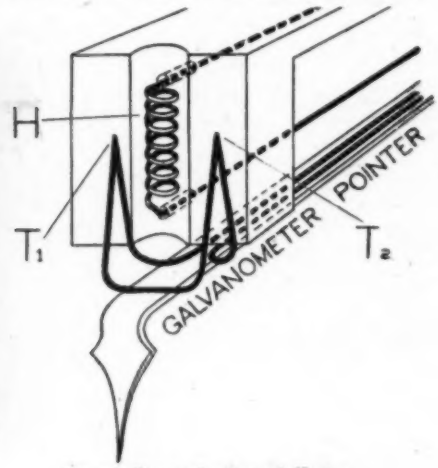


Fig. 4.—Thermo-Couples and Heater.

localised at one point, is placed immediately behind the thermo-couples. The heater is energised by a 14-V supply from a small transformer fed from the 105-V mains direct. At "bridge-balance" the pointer is in its neutral position, in which the heater is midway between the two thermo-couples. A change in the resistance coil of the electrical thermometer, brought about by a temperature change, throws the "bridge" out of balance, and hence deflects the pointer of the galvanometer. This brings one of the thermo-couples nearer to the heater; an e.m.f. is thus generated in the couple, which operates the moving-coil relay. The galvanometer complete with the thermo-couples and the heater, and the moving-coil relay, are mounted as one unit in a metal case. In a separate case are mounted two secondary or power relays. One of these is energised when the moving-coil relay is deflected. The vertical spindle of the latter forms a common terminal of the two secondary relays, and on either side of the spindle are two contacts which form the other terminals, one for each relay. When the spindle is turned by the deflection of its coil, connection is made with one of the side contacts, and the corresponding secondary relay is energised. These relays are connected so as to control the ½-h.p. operating motor in opposite directions, so that the "apron" will rise or fall. Energy for the secondary relays is supplied from the same transformer as the heater. The operating motor is supplied from a small motor generator, and the field is permanently "on," the secondary relays being arranged in the armature circuit. It is also connected through a reduction gear to the slide-wire contact of the variable arm of the Wheatstone bridge so that, as it raises or lowers the "apron," it also adjusts the contact until the bridge is re-balanced. The galvanometer is thus brought back to zero and the relays cease to operate and the motor is brought to a standstill. An efficient brake fitted to the motor ensures an almost instant stoppage of the "apron" movement. During periods when the temperature is rising or falling sharply, the relays are actuated about once in every three minutes, and during times of steady temperature, about once every half-hour. A second time switch governs the "thermometer," which is in operation from 6 a.m. to 12 m.n. The sign was designed and erected by Boro' Electric Signs, to whom the Cambridge Instrument Co., Ltd., was responsible for the design and installation of the temperature control apparatus.

Notes on Trolley-'Bus Traction.

An Interesting Undertaking in France.

By THEODORE RICH.

SINCE the war the trolley-'bus as a factor in passenger road transport has greatly increased in importance in a number of English cities. It has recently been taken up seriously in France. It may be remembered that at the Paris Exhibition in 1900, in the Vincennes Annexe, one of the features was a trolley-'bus on the Lombard-Gerin system; the 'bus was connected by cables with a motor-driven over-running trolley, the speed of the trolley motor being in synchronism with the driving motor of the 'bus, as the former was driven from slip-rings on the latter.

In some towns and districts in England the development of the trolley-'bus has been encouraged by legislation dating from the horse-tram days, requiring such undertakings to keep in repair the roadway between the rails. It is not realised that this regulation was in itself originally made to comply with the demands of local authorities for tribute from the capitalistic concerns that initiated tramway enterprise; nowadays when tramway problems are discussed, it is amusing to hear the complaints of the L.C.C. and other local authorities on this score, as what was sauce for the private-enterprise goose has turned out to be sauce for the "people's own" gander. Some authorities have put down railless trolley sections to avoid expenditure on overdue track repairs, and to avoid road maintenance expenses being charged to the tramway account; this is "robbing Peter to pay Paul," as the charge for road

upkeep comes on the ratepayers whichever way it is done.

In all questions as to road traffic whether it is a matter of tramways, trolley-'buses or motor-'buses, the vehicles, unlike an aeroplane which travels on air or a steamship that travels on the ocean, have to run on some form of track that is liable to wear out, and somebody has to pay for the upkeep; the passenger assists through his fare and the public through local rates directly

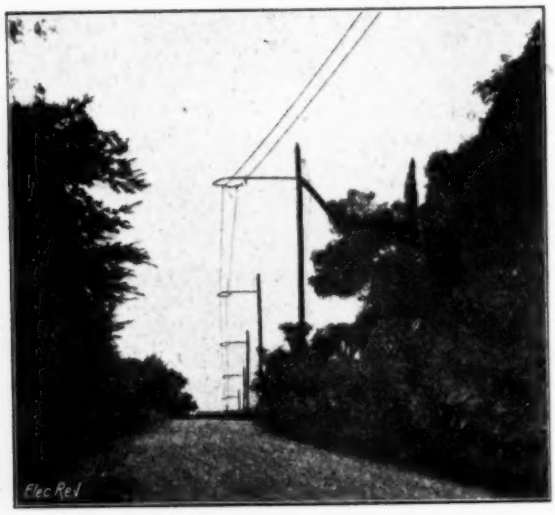


Fig. 1.—Trolley Line carried by Wood Poles.

or through purchases from local tradesmen—the money comes from somewhere. The trolley-'bus has undoubtedly a sphere of usefulness, but the system will be more injured than benefited if it is adopted to aid figure juggling by local authorities.

On the Continent.

In France as in England, due largely to the incessant demands of labour in so-called sheltered undertakings, the cost of construction and the expenses of maintenance of tramways and light railways have gone up enormously since 1914. Some undertakings in France, even where supported by local authorities, have had practically to treble their fares, and in some cases traffic has been reduced to about three trains per day each way.

In Italy during the war, owing to the high cost and difficulty of obtaining petrol, the trolley-road traction system underwent rapid development, and at the time of the Armistice several hundred kilometres of temporary and other trolley line had been erected for military purposes. In the South of Germany over twenty years ago a trolley-lorry system was started to haul stone from some quarries. There are in the United States a certain number of systems at work, although in early days the abominable state of American roads had a great deal to do with the rapid development of street and interurban electric traction, the more recent improvement in roadways bringing into competition in some places what are termed the " jitney " 'buses. In modern times the production of aluminium and magnesium on a commercial scale, great improvements in springing, the invention of solid and pneumatic rubber tires, the use of pressed steel sections to reduce the number of rivets and fastenings, and the improvements in steel and its alloys which enable much higher stresses than before to be taken by shafts and toothed wheels, have all tended to encourage road-borne as compared with rail-borne traffic.

It was largely the excessive wear and tear of the old steam coaches started about one hundred years ago that stopped mechanical road transport for such a length of time.

Trolley-'bus v. Petrol-'bus.

Not long ago M. Lévéque, chief engineer of the French Government Département de Ponts et Chaussées, with a M. Gex, made a study of the trolley-'bus and motor-'bus question, and came to the conclusion, at the prices of commodities and services then ruling, that while a motor-'bus cost 1.25 fr. for petrol, 0.24 fr. for lubricating oil, and 0.04 fr. for grease per 'bus-kilometre, an equivalent trolley-'bus cost 0.07 fr. for energy at 0.10 fr. a kW-hour, and lubricants 0.04 fr., the ratio for these items combined being about 13 to 1. After allowing for interest on first cost, depreciation, wages and repairs, the petrol-'bus cost 3.73 fr., as against 2.55 fr. per 'bus-kilometre. The cost of wages and commodities has gone up since those figures were calculated, but the ratio has not varied very greatly.

The question of the trolley-'bus was also dealt with in some detail in a paper read before the Société Française des Electriciens on July 5th, 1922, by M. M. Igléses, one of the engineers of the Constructions Electriques de France. He points out in his paper that from the point of view of comfort, the trolley-'bus is superior to the petrol-'bus because it is more silent, vibration is practically eliminated, and the unpleasant sensations of gear changing are avoided. It should be noted, however, that in the petrol-electric system of 'buses these difficulties are also largely avoided. From the point of view of French as well as English interests, so long as war risks remain conceivable, current derived from water power or native coal must be preferable to imported petrol which is subject to the operations of chamelionic international financiers.

As compared with the normal type of tramcar with rail return, the two-conductor trolley system practically eliminates all danger from electrolysis of pipes, &c., and such expensive expedients as negative boosters to comply with the seven-volts Board of Trade rule can be avoided. There is no doubt that there is scope for all three kinds of traction—tramways where cars run very frequently, and long double-deck bodies can be used; trolley-'buses where traffic is lighter; and motor-'buses where traffic is either very light or where the conditions in the streets in large towns make self-contained power vehicles a necessity.

When considering such questions, among the main factors are to be found cost of power in bulk, and average cost delivered to the trolley line, equivalent cost of petrol, wages, lubrication, repairs and depreciation, and interest charges on sub-stations, trolley lines, vehicles and equipment, tires, and car-sheds. Monsieur Iglésis, in the paper referred to above, gives some interesting formulæ and diagrams by which the relative spheres of usefulness of the different types of traction can be estimated. The existence of a power supply at

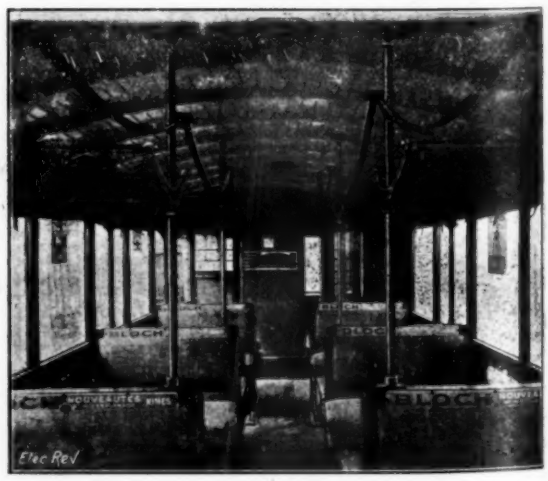


Fig. 2.—Interior of Trolley 'Bus.

convenient points along the route under consideration naturally favours the adoption of electric traction, as the cost of construction of a special power house is thus avoided.

A French Trolley-'bus System.

In France in recent years the motor-'bus has to a large extent taken the place of the old " diligence," and

to a certain extent that of the carrier's cart. In towns in the South, for instance, one finds 'buses with some seats inside which can be folded up, and part of the space used for all kinds of merchandise, from a sack of potatoes to a Paris hat in a hat-box; such 'buses radiate from market towns or connect neighbouring towns. It is this sort of traffic which, when sufficiently large, can under favourable conditions be adapted for trolley-'bus and trailer operation.

An interesting installation of trolley-'buses on the "railless" system is now at work between Nimes and Pont-du-Gard, in the wine-producing district to the west of the mouth of the Rhone. These two towns are joined by two trolley routes, one direct 25 km. (15½ miles) long, and the other forming two sides of a triangle 35 km.

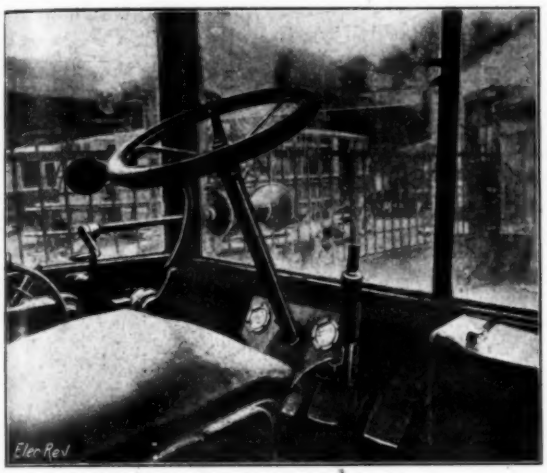


Fig. 3.—Driver's Compartment.

(21¾ miles) long, a number of small places being passed on each line. The equipment has been carried out by the Constructions Electriques de France, of Paris and Tarbes, a company that has a technical alliance with the English Electric Co. The roads followed are not of a uniform character; in places they are only 6 metres wide (19 ft. 6 in.). The gradients are not heavy, the maximum being 1 in 16.6.

Sub-Stations.

The power is supplied by the "Sud-Electrique," a company which distributes power over a large area in the South of France; it is delivered at 13,500 volts to two sub-stations, one at Lafoux, near Pont-du-Gard, and the other at Comps at the point of the angular loop. The equipment of both sub-stations is identical, comprising one 13,500 to 500-volt transformer, a slip-ring induction motor 150 h.p. 500 volts at 970 revs., direct coupled to a 100-kW d.c. shunt generator 550 to 750 volts. There is a high-tension and low-tension switchboard on the three-phase side, a d.c. generator panel, and two feeder panels.

There is also an accumulator sub-station placed between the two branches near the Nimes end of the triangle, near the centre of gravity of the system. The battery discharges automatically in the case of failure of the supply current; it is of 750 ampere-hours capacity, with 270 cells, plus 10 regulating cells. It is large enough to take care of the whole load of a normal day's traffic; for that reason there is not the usual necessity for spare gear in the motor-generator sub-stations. The sub-stations, generally speaking, look after themselves, although there is one man in charge of each. The accumulator sub-station runs without anybody being in charge, although it is regularly inspected.

Trolley Line.

The trolley line, see fig. 1, consists of two copper conductors, 87 sq. mm. section (.135 sq. in.), suspended from brackets attached to wood posts, the posts being kept off the ground by means of Pousolle type concrete bases. The posts average 7 m. 50 (24 ft. 7 in.) long, 14 cm. (5½ in.) at the tip, and 22 cm. (8⅝ in.) at the butt. The average distance of the posts apart is 25 metres (27.3 yd.). There are ten lightning dischargers on the trolley lines averaging 5 km. apart.

Coaching Stock.

The stock of vehicles consist of 10 trolley-'buses and 15 trailers of various types. The 'buses have an overall length of 7 m. 985 (31 ft. 5 in.), a width overall of 8 ft. 2½ in., a wheel base of 4 m. 40 (14 ft. 5 in.), and a wheel track of 2 m. 10 (6 ft. 10½ in.). The 'buses weigh 8 tons in working order, unloaded; one of them is shown in fig. 5, p. 1012. The forward (steering) wheels are fitted with 1,030 by 180 solid rubber tires, and the back (driving) wheels have twin tires 1,030 by 160.

There is seating accommodation for 34 persons, with standing room for four more (see fig. 2). Luggage racks are fitted, a matter of convenience where the length of a journey runs into several miles; on many 'bus and tram routes in the British Isles racks would also be a convenience. The seats are crosswise, as with the more recent London 'buses; a cross seat tends to more rapid discharge of passengers than longways seats, as people spot quickly where they are, and where the route is picturesque one can see out of the windows much better.

The 'buses are fitted with extraction ventilators; the seats are covered with rattan, and the electric lighting is arranged for by means of glass bowls in the ceiling. There is a baggage compartment at the rear which will take half a ton of passengers' luggage or merchandise; four tip-up seats are arranged in it for emergency use. Fig. 2 shows the interior of a 'bus looking towards the baggage compartment.

The passengers enter the 'bus at the front end on the right-hand side next to the curb, as traffic in France is to the right hand and not to the left as with us. A glass screen separates the driver (who also acts as the conductor) from the main compartment; passengers as they enter pay their fares and take their tickets through a window in the glass screen. Fig. 3 shows the driver's compartment; as will be seen, the seat is on the left.

Electrical Equipment.

Each trolley-'bus is fitted with two motors; each motor is of the DK 26 B type, fitted with four main poles and commutating poles. They are of the general type developed by the English Electric Co., hence the nomenclature DK. Each motor develops 20 h.p. at the car axle when the armature is running at 1,000 revs. per minute; the drive is by means of a worm and helicoidal wheel, so that the use of a differential is avoided.

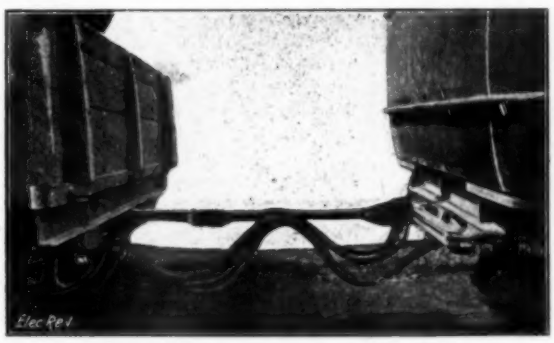


Fig. 4.—Draw-Bar, Brake Pipe and Cables.

The driver operates the controller by means of a pedal, which is notched up by successive pressings, the cylinder being returned to the off position by means of a coiled spring when the pressure of the foot is released. The reversing cylinder is operated by hand. The controller has nine running contacts, five for series and four for parallel operation; the last two positions are for shunting the fields at top speeds. The controller is fitted with solenoid blow-outs of the type with which the English Electric Co., as successors to Messrs. Dick, Kerr

and Co., has been identified since the days of the late Mr. Short.

The trolley poles are of the standard "Railless" pattern, which allows the 'bus as much variation on the roadway as is reasonably necessary for traffic conditions.

In addition to the usual resistances and resistance connections required for the starting of the main motors, for shunting the fields, and for operating the rheostatic brakes, there is a group of resistance frames which can be adjusted to suit the number of motor-propelled trailers forming a train when operating on a "mixed" service.

Fig. 5.—Trolley 'Bus and Self-propelled Trailers.

There are three systems of brakes—

(1) A hand brake acting on drums on the motor shafts.

(2) Rheostatic brakes controlled by a foot controller.

(3) A compressed-air brake acting on drums on the rear wheels, actuating also the brakes on the trailer cars.

There are two air-compressors, one driven by means of a chain off the shaft of each motor. As a rule, the hand and rheostatic brakes are used when the 'bus is run alone, the air brakes being usually used when there are trailers.

Trailers.

The trailers are 4.735 metres (15 ft. 6 in.) long, 3.19 metres wide, and have a 3-metre wheel base; they can carry a useful load up to four tons each. Each trailer is equipped with a 20-h.p. motor of the same type as the main 'bus motors; the rear axle is driven by means of wormgear. Electric couplers and cables connect the trailer motor or motors to the driver's cabin on the 'bus, and after suitable adjustment of the resistances, the trailer motors can be operated by means of the main controller pedal. Tests have been made with five trailers, but under normal traffic conditions the "mixed" service is operated with two trailers. Van bodies suitable for the transport of fruit and vegetables are fitted on some of the trailer chassis, and others are fitted with box bodies for the conveyance of sand, &c. Fig. 5 shows some of the trailers. Fig. 4 shows the draw bar, the air brake pipe which operates brakes on the trailers, and two cables and couplers for connecting up the trailer motors to the resistances and controller.

Traffic Operation.

On the direct Nimes to Pont-du-Gard route of 15½ miles, there are five passenger services a day in each direction, taking 1 hour 15 minutes on the journey, and one mixed service for passengers and heavy goods on trailers, taking 2½ hours. On the triangular route there are four through passenger services daily in each direction, taking 2 hours 10 minutes for the 21¾ miles, and 3½ hours for the mixed service. Of the villages served, five have a population of between 1,200 and 2,000, and two villages have 2,000 and 2,500 inhabitants. Agricultural produce is carried to Nimes; some goods depôts are arranged along the two routes.

The speed attained exceeds 30 km. an hour (18.6 miles) in the case of passenger traffic, and 20 km. (12.5 miles) an hour in the case of the mixed service. Those 'buses which have been in service since June, 1924, have averaged 30,000 km. (18,600 miles) per vehicle, while those set to work in November last year and February this year have averaged 20,000 km. (12,400 miles) and 10,000 km. (6,200 miles) respectively.

This system, with its simple overhead equipment supported on wood poles, its simple automatically-operated sub-stations, the absence of expensive feeders, and its service of parcels and heavy goods, is an example of what can be done at a reasonable capital cost when an effort is made to provide an installation which the revenue limits of a local, mainly agricultural, traffic, can allow for.

The design of the electrical apparatus was studied in France to suit operating conditions, the 'bus motors and controllers being constructed at Vénissieux, near Lyons; the chassis and the méchanical parts were designed and constructed at Tarbes in collaboration with the Railless Co.

The writer is indebted to the Constructions Electriques de France, of Paris, the contractors, for the technical details and photos of this interesting French installation.

The Electrical Measurement of Altitude.—A new instrument which measures altitude electrically, and about eight times as accurately as the ordinary barometer, to a height of at least one mile, has been constructed by the French physicists, Drs. Huguenard, Magnan and Planiol, and was recently shown before the French Academy of Sciences. The apparatus is based on the fact that a heated object cools off much more quickly in dense air than in very thin air or "near-vacuum," because in a near-vacuum there is very little matter to conduct or convey the heat away. The density of air depends on the altitude, so that an instrument that will measure air density will also give a measure of the altitude.

The device consists of a wire of great resistance, so that when an electric current is passed through it, a high temperature can be attained. Heat is immediately lost by radiation, convection currents in the air, and to a certain extent by conduction. After each of these leaks has done what it can, the temperature of the wire has reached equilibrium; and when once this balance is attained, changes in the temperature of the wire will be due to changes in the density of the surrounding air.

The electrical resistance of the wire changes with the temperature; a variation in the density of the air will therefore cause a variation in the intensity of the electric current, and this fluctuation can be used to measure the altitude, since the density varies according to the distance above sea level.—*Science Service.*

German Goods with an English Trade Mark.—During the hearing of an action in the Shoreditch County Court, on December 9th, before Judge Cluer, it was mentioned by Mr. Armstrong, counsel appearing in the action, which was to recover the price of a number of vulcanite syringes supplied, that the goods were ordered in February, but were not actually delivered until October, this being because they had to come from the Continent, and when they arrived on the first occasion there was a good deal of trouble with the Customs, as it was found that the goods were stamped with the defendant firm's English trade mark, and in consequence they had to be returned for the trade mark to be erased. Judge Cluer said that he was pleased to hear that the Customs Authorities were wide awake, and he hoped they always would be to prevent such a thing happening. Counsel had euphemistically called these "Continental" goods, but they were German goods and certainly should not bear an English trade mark.

Electricity Supply at Bexley Heath.

The New Sub-station of the Bexley Council Electricity and Tramways Department.

A GOOD example of some of the installations which are being put down to deal with bulk supplies is found in the new sub-station of the Bexley Council Electricity and Tramways Department and the Dartford Light Railways. A decision to scrap the old Bexley generating station and to take a bulk supply from the Woolwich Borough Council generating station culminated in the change-over of the Bexley Heath supply to the new sub-station in July last.

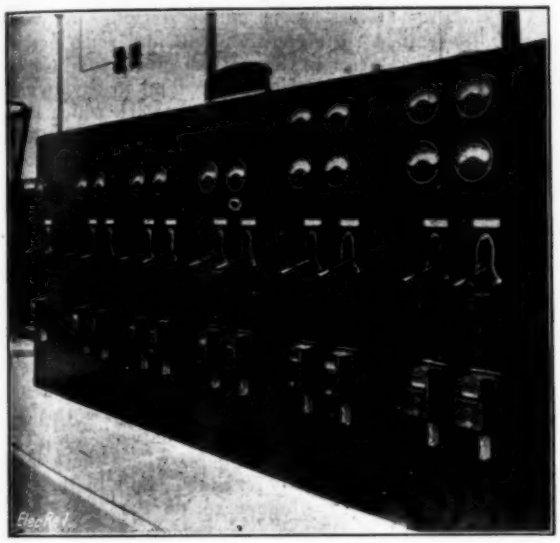


Fig. 1.—2,000-V Board.

The supply from Woolwich is received at 10,000 V, 3-phase, 50 cycles, by two 0.15 sq. in. 3-core, 33,000-V cables, provision being made for a possible increase in the transmission pressure by the Woolwich Council in the future. An eight-panel switchboard deals with the e.h.p. supply, two central panels being provided for the incoming cables. Two panels each feed a 700-kVA transformer bank for a.c. distribution, and two others feed two 380-kVA transformers supplying two rotary converters for the d.c. traction supply. A spare panel is intended for a 1,500-kVA transformer bank to be installed later, while the remaining panel provides cubicle accommodation for the potential transformers of the switchboard instruments. The transformer banks are Scott-connected with their secondaries supplying two-phase, 2,000-V (phase and neutral) to a 2,000-V distribution board, fig. 1. Each phase is dealt with separately by this board, and is fed into the single-phase, 2,000-V system of the undertaking, the network being split to accommodate the two phases. Seven panels are provided, two for the incoming feeds from the transformer banks, four feeder panels, and one spare for the future bank. Each panel is equipped with two s.p. breakers, one on each phase, and accommodates two circuits, separate phases, feeding to or from independent busbars. Both the 10,000-V and the 2,000-V boards are of steel construction, with steel-plate panels and cubicles. The 380-kVA transformers at the back of fig. 2, each reduce the supply to the converters from 10,000 V to 375 V. The rotaries, fig. 2, which were installed by the British Electric Plant Co., Ltd., are each of 300-kW capacity and provided with a direct-coupled pony motor for starting. A two-panel starting board, fig. 2, centre, equipped with the necessary main switches, field reversing switches, and lamp synchronising gear, is provided for these machines. The traction board, fig. 2, right-front, is of the open type with polished slate panels, two for the converters, three feeder panels, and one B.O.T. panel equipped with the usual rail leakage apparatus, &c.

A 150-kVA local transformer fed from the 2,000-V board supplies a l.p., 4-panel board of a similar type to that of the d.c. board, during periods of heavy load. The l.p. network is permanently looped through two panels of this switchboard, the other two panels providing for the feed from the transformer and the station lighting. The l.p. system is three-wire, 400 and 200 V, and is served by 14 transforming kiosks.

A booster transformer made by the Hackbridge Cable Co. is the only piece of apparatus brought from the original generating station. It is used as a negative booster on the bulk supply at 2,000 V to the Foot's Cray Electric Supply Co., situated about four miles away.

The building, 60 ft. by 35 ft., is of brick and steel construction, glazed brick inside, with a reinforced glass and wood roof. A 5-ton "Morris" hand crane serves the machine room. A small room is set apart as a workshop and testing house, and another, equipped with electric cooking apparatus, accommodates the staff. The premises were built by Messrs. J. W. Ellingham, Dartford, under Mr. J. Cowper, architect. The e.h.p. transmission cables from Woolwich were supplied and laid by The Pirelli-General Cable Works, Ltd. The switchboards were installed by Messrs. Johnson and Phillips, Ltd., who were entrusted with all the cabling inside the station. The switchboard instruments were supplied by Messrs. Johnson & Phillips, Everett Edgcumbe & Co., and Ferranti, and the transformers, other than the booster, are of the Swedish General Electric Co.'s make. The lay-out and specifications for the station were prepared by Mr. A. J. Abraham, the engineer and general manager, to whom we are indebted for assistance in the preparation of this article.

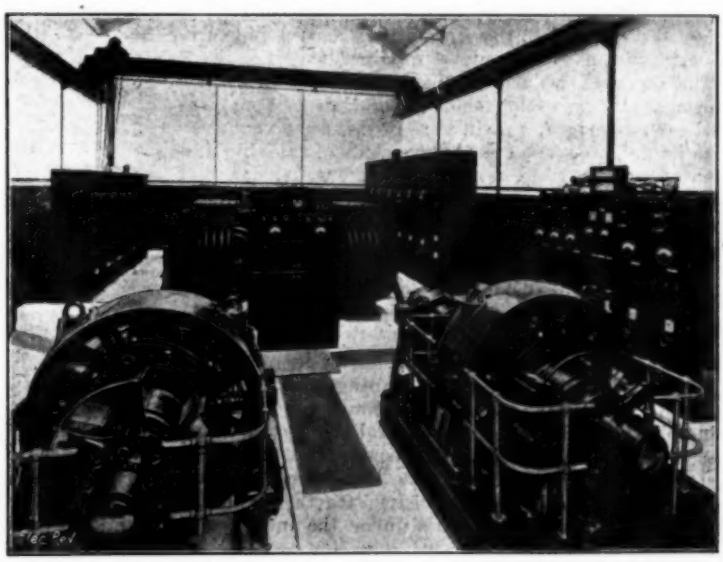


Fig. 2.—Machine Room.

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The Combustion Engineer.

His Training and Duties in Electrical Power Stations.

By CHAS. F. WADE, A.M.I.Mech.E., A.M.I.E.E.

THE fact that the highest thermal efficiency in steam raising units is to be found among the boiler plant supplying steam for electricity supply undertakings seems to be responsible for a curious fact that has been commented upon by various outside persons in conversation with the writer, who has observed the same thing personally. What is referred to is a very prevalent impression in a man's mind that because he is either in superior authority, or is on the generating staff of an electricity undertaking, he is, as a natural sequence, an expert on matters pertaining to fuel economy.

As a case in point may be cited the engineer who, after his new boiler house had been held at half working pressure for a week or so after lighting up, suggested quite seriously that the pairs of boilers were now ready to be coupled in series in readiness to work at full pressure! Another instance of appreciation of boiler-house problems is the objection a certain engineer has to turbine pumps owing to their constant speed. Again, take the case of a new battery of water-tube boilers whose exit flues are connected to an existing natural-draught stack; the stokers are fitted with balanced-draught fans, but these are not used, as the engineer considers the natural draught is sufficient and he does not for an instant realise the inefficiency and cost of chimney draught. Perhaps one other instance will suffice, and that is of an engineer who, in his own words, "will not give anyone best on boiler work," and who holds that scale in boiler tubes does not interfere with heat transmission, as, when at work, the scale is permeated with water and thus allows direct contact between the hot tube surface and the water. A very eminent power supply engineer some little while ago expressed an opinion to the effect that boiler-house control instruments were of little use, as an accurate return of water evaporated per pound of coal was all that it was necessary to know.

It is true that the highest efficiencies at the present day are to be found in modern power stations and, where not due to new plant embodying the latest advances in efficient heat transfer which has not had sufficient time to deteriorate appreciably, this high efficiency is almost entirely due to the unremitting control and careful supervision of a specially qualified expert.

The separate branch of the engineering profession known as "combustion engineering" is of comparatively recent origin, and in view of this some vagueness as to its definite scope and requirements of training and knowledge is perhaps, to a certain extent, pardonable; this lack of appreciation is frequently reflected in the scale of emoluments offered in connection with vacancies for such positions. In some stations a highly trained fuel chemist is given the duty of supervising the efficient operation of the boiler plant, but the knowledge and training needed call for more than a good training in chemistry, and the writer would be inclined to favour an enginer with an aptitude for chemistry in preference to a chemist with engineering leanings. Although a thorough appreciation and understanding of chemical principles is needed for the successful combustion engineer, a very wide knowledge of this subject is not called for; probably a more extensive knowledge of heat-physics is needed than of chemistry, together with the physical properties of materials under the influence of high temperature.

That the boiler-house superintendent should be an engineer to begin with is essential in view of the fact that practical limitations are met with in many directions, and such are almost always of an engineering nature, where they do not consist of questions of financial expediency. The latter again show the necessity for some financial or business capacity so that the feasibility or otherwise of any proposition can be reduced to reliable values in £ s. d.

The control and handling of a boiler-house staff require some knowledge of psychology in order to impart knowledge to, and to get the desired results from, men of widely varying temperament.

It is but rarely that a specialist starts his training as such, but he develops his special aptitude during the course of duties and work of which the subject in which he specialises eventually is but a section. A young generally-trained shift engineer will find some portion or other of his duties in the station appeal to him more strongly than others, and will thus tend to devote most of his attention to that branch of his work which tends to attract him most; this is the usual beginning of a combustion engineer as a specialist, and chiefs would be well advised to look out for such tendencies and to encourage them so far as is possible, in their own interest.

As to the special scientific training required to qualify him for a responsible combustion-engineering post, a shift engineer is somewhat under a disadvantage owing to the interruption to continued spare-time attendance at technical classes involved in the change round of his duties. As already mentioned, the chief would do well to encourage the keen combustion man and therefore to single him out for day-time work only on duties connected with the boiler house, fuel analysis, &c. This does not apply, of course, to places where there is no technical instruction locally available, and in these instances the aspirant will have to do the best he can with books and perhaps correspondence tuition. The latter, particularly if taken as an adjunct to everyday work, should be especially valuable. Actual combustion engineering courses are not, as yet, very widely available in the technical colleges, though they may be obtained at the Northampton Engineering College (Clerkenwell), Leeds University, and Swansea University College, among others.

If the preliminary training has been of the usual practical and technical order, including the customary heat-engine courses, the principal additional instruction needed will consist of a certain amount of chemistry and physics, while the necessary mathematical knowledge is not at all formidable as it does not extend beyond the limits of simple arithmetic, and practically all calculations are readily worked out with an ordinary 10-in. slide rule.

The chemical knowledge called for in a combustion engineer, as distinct from a fuel technologist, will be amply provided by a course of elementary inorganic chemistry, to give the proper understanding of chemical principles and laws, together with some instruction in the earlier portions of organic chemistry, especially as it affects the simpler hydrocarbons and carbohydrates. As the duties of the combustion engineer usually include the examination and treatment of feed water, some extra attention must be given to the properties of water and its impurities, solid and otherwise. In the chemistry course the student should acquire some knowledge of the methods of qualitative analysis in order to be in a position to appreciate questions of ultimate analysis of fuel and the analysis of feed water, but such work should not form a part of the regular duties of the post under consideration, being the province of the specially trained analytical chemist; as such it would occupy too large a proportion of the working day, to the exclusion of the practical application of such investigations.

The training in heat physics should be as complete as possible, especial emphasis being laid upon the all-important principles and laws of the transmission of heat by various means, such as radiation, conduction, and convection; influence of surfaces on the absorption and

dissipation of heat; influence of gas velocities on heat transfer; laws of gases, and so on.

As regards psychology, with some individuals this appears to be a gift, but in the majority of cases this rather abstract quality is developed in a person by careful attention to and study of the mental idiosyncrasies of the various persons under his supervision. Coupled with psychology may be mentioned tact, and it is difficult to draw a clear line of demarcation between the two qualities. If reliance is placed merely upon the autocratic attitude of " do as you are told or get out " it is a foregone conclusion that the whole of the employés will get into a habit of working like unthinking machines, merely carrying out the letter of their instructions and no more. With a raw staff who have not previously been accustomed to working for high efficiency, this will no doubt be effective up to a point in improving matters, and also up to the same point the " company sergeant major " attitude will probably prove of value in forcibly demonstrating to the men that their boss knows what he is talking about by the improvement in results obtained. To obtain the highest practical efficiency of which a boiler plant is capable will call for intelligent appreciation by the working staff of the reasons why certain methods of operation lead to improved results, and it is up to the combustion engineer to foster this state of mind. To be successful, therefore, calls for careful study of the men concerned, and imparting the required knowledge and interest in the manner most suitable for the individual.

We now come to the business or financial side of the question. A fully qualified combustion engineer must not only be able to get the highest possible efficiency from the plant for which he is responsible, but must also be able readily to calculate the ultimate financial result of improved methods, in view of the well-known fact that over a given point thermal efficiency and commercial economy cease to be the same, and that further improvements cost more to obtain than the value of the saving to be effected. Similarly, he must be able to weigh carefully and accurately the possibilities of new plant and accessories brought down to the ultimate question of net money saving. This calls for full consideration of money-earning value of space occupied, standing charges for depreciation, maintenance, and interest on capital, labour and power charges, and so on, all to be set against the gross economies to be effected by the changes contemplated.

Above all, the successful combustion engineer must keep an open mind with regard to modern advances, and not be prone to condemn or to approve of any plant or apparatus without due thought and consideration. He must also keep abreast of the times, and as it is a physical impossibility for any one man to have practical working acquaintance with each and every type of plant and accessory in existence, he must give full study to the permanent and periodical literature relating to his particular sphere of activity. As regards periodical literature specialising in combustion work, about 50s. per annum would cover subscriptions for the whole of it, including one very valuable publication produced in America.

Coming now to the scope of the combustion engineer's duties, this will be governed to a large extent by the size of the plant under his control. In the smaller stations he will obviously have to carry out a large portion of the practical detail work personally, while in the large stations he will be at the head of a staff of assistants, the most important of these being the boiler-house shift engineers and the chemist. His position must be such that he is responsible directly to the chief engineer without the intervention of any intermediaries whatever. This often makes a new man's position somewhat uncomfortable for a time, as it is perhaps a matter of human nature that men of comparatively long service with an undertaking will feel some resentment at a newcomer being appointed to a post carrying a higher salary than their own. The obvious remedy for these longer-service men is not to waste their time grumbling, but to do their best to qualify themselves for a similar job. Incidentally, one wonders whether the somewhat inadequate salaries usually offered for combustion engineers are due to the chief's disinclination to upset his existing staff.

Coming back to the question of scope of duties, this cannot be better described than everything connected with the fuel from its initial selection and purchase, the economical and efficient extraction of the utmost percentage of its potential heat, to the final rejection of the ashes and waste gases. The main line and ramifications of the subject are enormous, and are extending daily.

The best of workmen cannot work without tools, and if a man is offered the position of combustion engineer, before definitely taking up the post, he must insist that he shall have a free hand in the selection and installation of the necessary instruments and other indispensable apparatus. It is true that in many stations to-day the application of what the writer terms " scientific rule of thumb," or improvements in operation based upon scientific knowledge without the aid of instruments, will go a very long way in reducing fuel costs, but even the improvement thus obtained will not satisfactorily approximate to the degree of efficiency consistent with present-day possibilities.

It is impossible to ignore the fact that in all considerations of professional career and position the question of remuneration is a very important one. The writer is aware that the supply of really qualified combustion engineers in this country is very limited, many applications for such posts being from shift engineers who are employed in highly efficient modern stations, but who are unable to produce any evidence that they themselves are in any way responsible for the good results. There are, no doubt, many such engineers who propose to get the job first and then to qualify themselves for it as time goes on; while inadequate salaries are the rule, this is the only type of man the advertiser has a right to expect, and he will merely make his boiler house a sort of training ground for men who wish for an opportunity to devote the whole of their time to the study of combustion, so as to qualify themselves eventually for a better post elsewhere.

The grading of a chief combustion engineer should never be below Grade 3 on the N.J.B. Schedule, while qualified shift engineers or assistants should in every case be graded about Grade 5 when engaged solely on boiler house and fuel economy work. The writer considers that while Grade 1 applies to deputy chief officials, Grade 2 should be allocated to the superintendent combustion engineer. This certainly appears to be the correct state of affairs in view of the predominating importance of the combustion department in modern power generation.

International Agreements.—In the course of his speech at the annual meeting of Dorman, Long & Co., Ltd., the chairman, Sir Arthur Dorman, said that there was a probability that the iron and steel trades' application for protection would be rejected and that they would have to go on fighting unaided. He attributed the bulk of the evils under which we were labouring to lack of demand and the disparity between conditions in this country and on the Continent. The real remedy for these evils was an understanding with Continental producers which would be of advantage to both parties, and much more effective than any purely internal agreements. Sir Arthur concluded in an optimistic vein. He said that we were not far from turning the corner; we were nearing the end of the post-war depression.

The Shannon Scheme Dispute.—Mr. McGilligan, the Irish Free State Minister for Industry and Commerce, stated in Dail Eireann last week that work upon the Shannon scheme was proceeding. Over 900 men were working, including about 140 Germans. He contended that the men were satisfied with their conditions, in spite of the statements of trade-union leaders.

Australian Production and Imports.—In last week's *Board of Trade Journal* was published a comparative statement of the imports of various classes of goods into Australia, and the production of such goods in the Commonwealth, in the year 1923-24, the latest period for which figures are available. The table shows that imports of electrical apparatus were valued at £4,865,975, while the value of the home production was £1,233,317.

The Electrification of Textile Mills.

Some Important Contracts.

SEVERAL important and interesting contracts for electric driving and direct-geared turbine driving of textile mills, both at home and abroad, are being executed by the Metropolitan-Vickers Electrical Co., Ltd.

Work in hand for Messrs. J. & J. Hayes, of Leigh, Lancashire, covers the complete electrification of the greater part of the Victoria Mills, the installation having been laid out by Mr. A. B. Mallinson, consulting engineer. The equipment includes a 2,000-kW, 3-phase, 2,200-volt, 3,000-r.p.m. steam turbine generating set, motors totalling about 3,000 h.p. with control gear, sheet-steel cubicle-type switchgear, and a step-down transformer for lighting purposes. Interesting features of this installation are the closed-circuit ventilation system

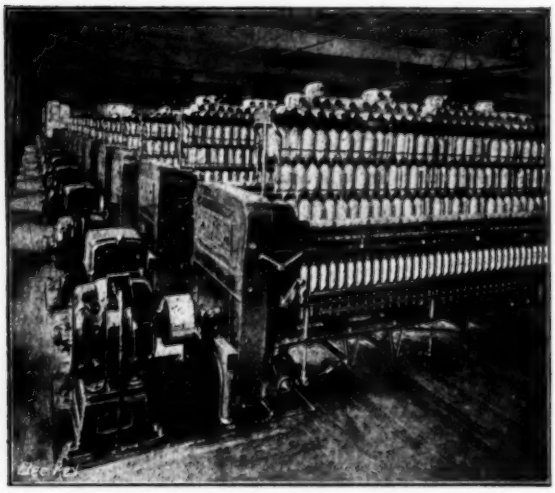


Fig. 1.—Ring Spinning Mill driven by M.-V. Motors.

to be used for the alternator, the use of a voltage regulator, and the employment of squirrel-cage motors arranged normally to start and run up to speed with the generating plant.

Electrical equipment is in hand for three mills at Preston of Messrs. John Hawkins & Sons, including motors totalling over 3,500 h.p., with liquid controllers and ironclad control pillars, and a separate main switchboard for each of the three mills.

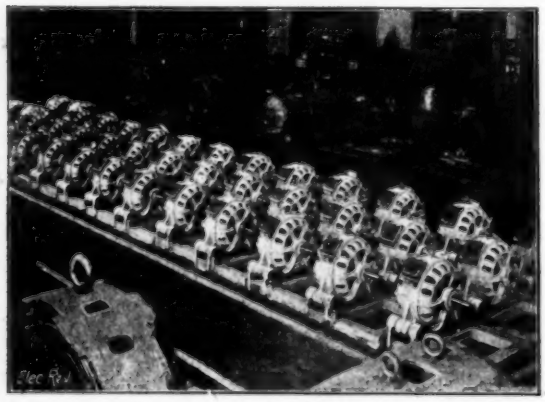


Fig. 2.—Motors for Ring Frame Drives in a Brazilian Mill.

For the Rishton mill of Messrs. O. & J. Folds, Ltd., of Burnley, motors totalling about 500 h.p. are being supplied, together with liquid controllers and ironclad control pillars.

Equipment is now being installed at the important bleach and dye works of Messrs. John Welch & Sons at Chinley, which includes two generators of 250 kW and 50 kW, respectively, motors totalling about 400 h.p. with the necessary control gear, and also a complete main switchboard.

The illustration, fig. 1, shows a ring spinning electrical drive at the Empire Spinning Company's mills in Oldham. Twenty such equipments were supplied in 1922, 16 duplicate sets in 1924, and 20 additional sets are being completed now, all the equipments being ordered through Mr. Robert Blackmore as consulting engineer.

The Metropolitan-Vickers export textile equipment contracts are mostly for Brazil and India. In fig. 2 are shown motors for ring frame drives, forming part of an order for a new mill at Sao Paulo; this contract includes motors totalling 730 h.p., and transformers totalling 2,100 kVA capacity. Other contracts for Brazil include motors totalling over 1,200 h.p., for use in eight different mills. A number of these motors are for the Cia Fiacao Mill at Pirassununga, where already M.V. Co. motors totalling over 1,500 h.p. have been installed.

For India interesting contracts now in hand include three geared turbine sets, with condensers, for the direct mechanical drive of the mills. These contracts include turbines of 1,000 h.p. in two instances, and one of 4,500 h.p.; the latter, we are informed, represents about the largest output by the direct drive for which so far a steam turbine has been installed.

Extensions at Maidstone.—On Saturday last recent extensions to the plant and buildings of the Corporation Electricity Works, Maidstone, were officially inaugurated by Mr. J. Hillier French, past chairman of the Electricity Committee. The main extensions consist of a 3,000-kW Brush-Ljungström turbo-alternator and two Vickers-Spearing boilers each of 30,000 lb. per hour capacity, with the necessary switchgear and auxiliary plant, contained in an entirely new ferro-concrete building, turbine and switch room and boiler house. The station now has a total capacity of 8,575 kW. At an inaugural luncheon which followed the opening ceremony, Mr. S. P. Sanders, vice-chairman of the Electricity Committee, presided in the absence of the chairman, Mr. W. H. Martin, who was indisposed. After the loyal toast, Mr. French, in proposing "The Maidstone Electricity Supply Undertaking," paid a tribute to the borough electrical engineer, Mr. E. E. Hoadley, M.I.E.E., referring to the designing of the new extensions and to the management of the undertaking in general. In Mr. Hoadley, he said, the Corporation had an engineer who was a keen business man. The combination of the two qualifications was essential in the management of modern undertakings. Mr. Sanders in reply read a letter from the chairman reviewing the progress of the undertaking from its commencement 24 years ago. Mr. Hoadley also replied and referred to the happy position of the concern which he controlled with regard to its industrial load. The load factor of the station would this year exceed 43 per cent. In reply to "The Visitors" by Councillor F. R. Connor, Mr. J. Andrew Lee, technical adviser to the Electricity Commissioners, conveyed the congratulations of Sir John Snell to the Corporation and its electrical engineer on the broad-mindedness shown in extending the distributing mains to the areas surrounding Maidstone. Mr. Lee said that the Electricity Commissioners would like to see other supply engineers following the example of Mr. Hoadley in paying unofficial visits to them when any important question could be discussed with advantage. The Commissioners could not make progress without the co-operation of the supply undertakers, and too many of the latter took a too parochial view with regard to their undertakings. The industry as a whole was making headway, costs were coming down, and the thermal efficiencies and the loadings were improving. Mr. J. W. Beauchamp, director of the Electrical Development Association, also replied. He congratulated the Electricity Department on having the high consumption figure of 400 kWh per head of population. Engineers generally did not plan plant extensions with sufficient generosity. He thought there would be inconvenience in many places by Christmas, 1927, when the plant available would be inadequate for the ever-increasing demands. Maidstone was an important industrial centre as well as a town of agricultural importance situated in a beautiful country district. This curious mixture, he thought, might prove the solution of a modern problem in electricity supply in the "better world to come."

New Berlin Generating Station.—According to *Power* a new municipal generating station is being built in Berlin on the bank of the Spree River at Rummelsburg, which is to have an ultimate capacity of between 500,000 and 600,000 kW. The first section will be equipped with 16 boilers, each with a heating surface of about 19,000 sq. ft., and fired by pulverised fuel, three 70,000-kW twin-tandem compound turbines, and three 10,000-kW bleeder turbines for stage feed-water heating.

The Electrical Trade Section at the Birmingham Fair.

Progress of the Movement.

WE are pleased to learn that electrical firms are making a very gratifying response to the invitation to make small exhibits in the Electrical Trade Section of the British Industries Fair at Birmingham from February 15th to 26th.

Our anticipations that the importance of making an effective representation of British electrical products would be appreciated by manufacturers when the matter was properly brought before them, have already been fulfilled. The attention that we devoted to the subject in our issues of November 20th and December 4th, and the emphatic way in which we stressed the need for action, have been fully justified.

Shortly after the meeting held at the Birmingham Chamber of Commerce, the provisional electrical committee met, some leading electrical representatives who had been unable to attend at the first meeting being present. As a result of deliberations on this occasion it was decided to ask Mr. W. A. Gillott (who did such excellent work for the industry in the E.D.A. corner at Wembley) to proceed to secure exhibitors to fill the space that was known to be available in one of the large buildings at Castle Bromwich. In the course of a few days many spaces had been allotted and many more may be booked before this issue of our journal reaches the readers' hands.

Down to the end of last week a considerable number of firms producing various kinds of electrical goods had definitely taken space. We would impress upon others the necessity for making up their minds promptly so that the management and committee may get forward with the final organising arrangements. It is possible to have a sample counter display for an inclusive cost of £10, or a small stand (made with hired material) for an inclusive cost of £16 or £17. Forms showing such stands and giving all details can be obtained from the General Manager, British Industries Fair, 95, New Street, Birmingham.

In the Hall containing the Electrical Trade exhibits it is proposed to erect a booth of considerable size where visiting Association delegates can meet, confer, and dine together.

As should be well known by this time, a very large number of postal invitations have been issued by the Board of Trade to potential buyers in the Colonies and in foreign countries. By means of advertisement announcements in newspapers and trade papers published overseas, other invitations have been issued to an even larger body. To all of these who read the ELECTRICAL REVIEW, and to any of our special audience who have not received or seen such invitations, we are able to give a definite assurance that at Birmingham there will be a large group of representative British electrical exhibits, which together with the other features of the great British Industries Fair both in Birmingham and in London, will make a visit during the twelve days well worth while. We understand that British wireless trade products will be displayed at the London end of the Fair—at the White City.

We trust that immediately after the Christmas vacation, steps will be taken to secure the presence at Birmingham at some time or other during the run of the Fair of merchants interested in export trade, of architects, hardware men, ironmongers, and departmental managers of the great stores in different parts of the country.

Electrical retailers and factors from all points of the compass should make an endeavour to spend a day there, as a trade event of this character should possess particular value for them.

It is mainly upon the presence of the right class of visitors from at home and abroad that the success of the 1926 exhibition depends; and upon the 1926 result depend the continuance and development of the Electrical Section of the Fair in subsequent years.

The following are included in the list of electrical exhibitors:—

Sturge & Baker, Ltd.
Falkirk Iron Co., Ltd.
Tucker, J. H., & Co., Ltd.
Relay Automatic Telephone Co., Ltd.
Electricars, Ltd.
Mouldensite, Ltd.
Manda Motors, Ltd.
London Elec. Wire Co. and Smiths, Ltd.
Reeves & Co.
Magnetic Separators, Ltd.
McGeoch, Wm., & Co., Ltd.
British Elec. Repairs, Ltd.
Commutator Grinding Block Co., Ltd.
Sheringham Daylight Co.
Rapid Magnetting Machine Co.
Tok Switches, Ltd.
Waygood-Otis, Ltd.
Chloride Electrical Storage Co., Ltd.
Higgs Motors.
Siluminite Insulator Co., Ltd.
Canning, W., & Co., Ltd.
Premier Elec. Heaters, Ltd.
Nobbs, Geo., Ltd.
Imperial Engineering Co.
Coley & Swinnerton, Ltd.
Jackson Elec. Stove Co., Ltd.
General Electric Co., Ltd.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The "Electrical Review" Index.—The Index to Vol. XCVII (for the half-year ending December 31st, 1925) will be published shortly, and we shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.4.

The Timber Trade. — Our timber trade correspondent reports that the market for general construction woods, imported from the north of Europe, has now got over its difficulties of late summer, when prices for forward delivery from shipping ports were low, with keen selling competition and poor values also in this country. The imports in both October and November showed a decline compared with the corresponding periods of 1924, and with an early closing of navigation there is not much more timber to come forward from northern Europe this season. Although stocks are large the consumption continues very good, and prices have become much firmer. In the hardwood section of the trade teak and mahogany are firm, as are also oak, ash, walnut, &c. The supplies from America are improving in value as shippers in that country are very firm in their ideas of the market. This has a great influence on spot prices, but it also has the effect of making wood consumers look more towards British hardwoods, the better qualities of which are second to none in the world.

Correction.—We regret that in a Catalogue Notice in our issue of December 18th we made mention of the "Ray Engineering Co., Ltd." The concern is owned solely by Mr. R. C. Carter and "limited" should not have appeared.

Lead. — In their report dated December 19th, Messrs. James Forster & Co. stated:—"There was a better tone about the market this week, and although consumers have not been active, a certain amount of buying has been seen. This, and sympathy with other metal markets, was sufficient to lift the prompt price of lead nearly 20s. per ton from the lowest prices touched. There is still no lack of prompt lead, which is generally the case about this time of the year. The future course of prices depends largely on whether consumption revives in this country and in Germany over the turn of the New Year. Consumers have shown very little interest during the past month or six weeks and, it may be, will have to enter the market after the holidays for supplies, with a consequent further recovery in values. On the other hand, if present conditions continue into next year, prices will probably fall away to a still lower level."

New French Company.—La Société d'Electrification de la Region de Bourbon-Lancy is the name of a new company which has lately been organised at Moulins with a capital of 1,600,000 fr. to establish an electricity distribution system in that district.

The British Industries Fair.—In order to relieve apprehensions which have arisen, the Birmingham Chamber of Commerce has issued a circular definitely stating that no retail selling will be permitted at the Birmingham section of the Fair. At the London Fair retail sales will be confined to "tasting samples" in the food and Empire sections.

Hackney Electricity Staff Club.—There has been established in connection with the Hackney Electricity Department the "Hackney Electricity Staff Club." Its objects are to provide catering facilities, social functions and recreative and educational opportunities for the staff of the undertaking. For five days a week members of the staff are served with an excellent lunch, cooked electrically, at an extremely moderate figure, the meal being prepared in an electric kitchen adjoining the club dining room. We had an opportunity last week of inspecting the club arrangements at the magnificent Demonstration Hall and Showrooms at 18-24, Lower Clapton Road, and found them to be all that one could desire. By the way, we would parenthetically recommend borough and other supply engineers and commercial managers to take an early opportunity of visiting the Hackney Hall, as all the notes and illustrations published in the Press have failed to do it full justice because the true idea of space and coloured illumination effects cannot be conveyed by prosaic newspaper printing. Mr. L. L. Robinson is president of the club, with Mr. J. R. Bowden as vice-president, and Mr. D. C. Clark as hon. secretary. Members pay a subscription of 1s. per month or 10s. per year, and they are entitled to bring visitors. The affairs of the club are in the hands of a management committee.

Trade Announcements.—The address of OERLIKON, LTD., is now Oerlikon House, 28-31, Essex Street, Strand, W.C.2. Telephone: City 3421 and 3422; telegraphic address: "Oerlik, Estrand, London."

MESSRS. JESSOP BROS., electrical engineers, have opened premises at the Reliance Works, 17, Beast Market, Huddersfield.

MR. LAWRENCE CHARLTON has taken over the business of Messrs. Sleigh & Wood (Pilgrim Street, Newcastle-on-Tyne), recently carried on by the late Mr. Lionel Wood. Mr. Charlton has been manager for a number of years. All debts prior to his taking over (September 12th, 1925) will be attended to by the administrator of the estate, Mr. Adamson Rhagg, 18, Clayton Street, Newcastle-on-Tyne.

THE ENFIELD CABLE WORKS, LTD., has just opened a depôt at 14, Marble Street, Manchester, for the sale of its rubber-insulated wires, cables, flexibles, &c., of which large stocks are held there.

The London address of MESSRS. SANDERSON, MURRAY AND ELDER, LTD. (buyers for Messrs. Turnbull & Jones, Ltd., of New Zealand, and for Messrs. W. G. Watson & Co., Ltd., of Australia), is now 47, Gresham Street, E.C.2, where they will be pleased to see representatives of electrical firms.

The LONDON MAGNETO REPAIRING & WINDING CO., LTD., of 78, Hampstead Road, London, N.W., has been appointed a service depôt for horns and other products of the E.A. Laboratories Inc., Brooklyn.

Catalogues and Lists.—MESSRS. GEORGE COHEN, SONS AND CO., LTD., 660, Commercial Road, E.14.—A comprehensive descriptive list of machinery and plant (new and second-hand) for sale. Also pamphlets dealing with inspection trolleys, gas, steam and water fittings, &c.

MESSRS. J. HOPKINSON & CO., LTD., Britannia Works, Huddersfield.—List No. 1860, advertising the company's draught gauges. Illustrated.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—Two showcards in colours advertising the company's "Velvact" potentiometers and variable resistances.

THE BRITISH B.A.G., LTD., Orme Buildings, Parsonage, Manchester.—A showcard advertising the "Lomax" lampholder, from which screws are absent.

THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17.—"The Benjamin Reflector" for Christmas, suggesting a number of seasonable gifts.

"MANDA" MOTORS, LTD., 53-54, Royal Mint Street, E.1.—A price list of electric fans and small power motors.

THE CONTRACTORS' SUPPLIES CO., 5, Finsbury Square, E.C.2.—A price list of electrical materials and accessories.

HIGGS MOTORS, Witton, Birmingham.—A priced stock list of a.c. motors and d.c. dynamos and motors.

CARRON COMPANY, Carron, Stirlingshire.—A well-illustrated catalogue of the company's heavy cooking apparatus for employment in restaurants and institutions, and on board ship. The list includes electric baking ovens.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—A mailing card advertising the "Magnet" pedestal heater, toaster, iron and kettle. Priced.

MESSRS. GEORGE NOBBS, LTD., 87-89, Cleveland Street, Fitzroy Square, W.1.—Catalogue Sections Nos. 215 and 216, dealing respectively with "Genii" safety electric geysers, and electric urns and water boilers. Illustrated and priced. Also a print of a completely fitted bathroom in miniature.

MESSRS. EVERSHED & VIGNOLES, LTD., Acton Lane Works, Chiswick, W.4.—An illustrated brochure describing the "Meg" insulation tester; and a descriptive list of the company's recorders for various applications.

THE RANSOMES & MARLES BEARING CO., LTD., Newark-on-Trent.—A booklet containing illustrations, prices, &c., of ball and roller bearings.

MESSRS. E. BENNIS & CO., LTD., 28, Victoria Street, S.W.1.—An illustrated brochure dealing with the company's stoker and self-cleaning furnace.

MESSRS. T. BEADLE & CO., LTD., 3, Castle Street, Hull.—A comprehensive illustrated and priced catalogue of radio apparatus of all kinds.

MESSRS. PHILLIPS & TURNER, Cambridge Street, Birmingham.—Illustrated leaflets advertising lanterns, lamp canopies, ceiling plates, brackets and other lighting fittings.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—Publications Nos. 396a, the "Primax" loud speaker; 439, the "Mellovox" loud speaker; and 440, the "Miniloss" square-law condenser. Illustrated and priced.

Bankruptcy Proceedings.—F. A. FRASER, electrical engineer, 33, Tothill Street, Westminster.—An application for an order of discharge was made recently to Mr. Registrar Francke at the London Bankruptcy Court on behalf of this debtor, who failed last June with ranking liabilities of £3,020 and no realisable assets. The Official Receiver reported that since 1909 the bankrupt had acted as director of a number of limited companies, including the Electrical Contracts & Maintenance Co., Ltd., which went into liquidation in 1924, and was succeeded by the Electrical Contracts & Maintenance Co. (1925), Ltd. He attributed his failure to the insolvency of the old company and his liability as guarantor on its behalf. The application was opposed on the grounds (1) insufficiency of assets to equal 10s. in the £ on the amount of the liabilities, and (2) contracting debts provable in bankruptcy without having reasonable or probable ground of expectation of being able to pay them. His Honour suspended the discharge for two years.

JAMES WILSON, electrical engineer, 70, Ebrington Street, Plymouth.—This debtor appeared for his public examination at Plymouth on December 18th. Examined by the Official Receiver, he stated that after working as a journeyman in different parts of the country he fell out of work, so he started in business on his own account, without capital, and, later, commenced a partnership with another man, who provided £200 capital. After three months the partnership was dissolved, debtor paying £50 in settlement and taking over the liabilities of the business. He moved to his present address but found the rental a heavy burden. Pressed by various firms he executed a deed of assignment in October, 1923. At that time his liabilities were stated as £448, but the list was incomplete. The assets amounted to £388. He started again in business after paying a dividend of 6s. 8d. in the pound. He made a good living until the beginning of 1925, when he fell ill and was unable to give proper attention to the business. The examination was closed.

E. O. HENSTOCK, 21, Old Road, Brampton, Chesterfield, Derbyshire, electrical engineer and wireless dealer.—The first meeting of creditors was held on December 18th at the Official Receiver's offices, Nottingham. According to the statement of affairs, there was a deficiency of £259. Debtor attributed his failure to competition in the radio trade and the illness of his family. He commenced business on his own account in October, 1922. Subsequently he entered into partnership with another, but this was dissolved. In September, 1924, he started dealing in radio goods, but the business was a failure, and he became aware of his position in the following March. There was not a quorum of creditors present at the meeting, and the matter was left with the Official Receiver as trustee of the estate.

G. J. C. THORNE and A. H. THORNE (Lawrence Electrical Trading Co.), electrical engineer, late of 159, High Street, Notting Hill Gate, W.—Last day for proofs for dividend, December 31st. Trustee, Mr. D. Williams, Official Receiver, Carey Street, W.C.

W. G. BAYMAN, electrical engineer, late of 13, Russell Street, Plymouth.—Application for discharge to be heard January 11th, at the Court House, Wandsworth, S.W.

Company Liquidations.—MORCH BROS., LTD., radio instrument manufacturers, 35, Tresham Avenue, Clapton, E.—The accounts filed under this compulsory liquidation show liabilities of £1,327, assets valued at £453, and a total deficiency of £1,874 as regards contributories. Mr. E. T. A. Phillips, Official Receiver, reports that the company was formed in December, 1924, by Jacob Johannus Morch, for the purpose of carrying on the business of motor engineers and manufacturers of radio instruments and appliances. Morch stated that the motor business carried on by him and his brother was not a marked success; in the autumn of 1923 they commenced to manufacture radio sets and accessories, and installed plant for that purpose, but were handicapped by lack of capital, and they therefore borrowed £250 from his wife and a further £100 from a Mr. O. E. Nielson, on the understanding that a company should be formed and debentures created and issued in respect of such advances. By an agreement, dated January 30th, 1925, made between Jacob Johannus Morch and the company, the latter purchased the assets of the business for a consideration of £2,526, to be satisfied by the allotment to himself and his wife of all the share capital of the company, £1,000, as fully paid up, a cash payment of £156, and by the company discharging all the debts and liabilities of the vendor in relation to the business, he being indemnified

against all claims in respect thereof. The company also carried on a retail shop at Lower Clapton Road, London. In March, 1925, the directors issued five 6 per cent. debentures of £50 each to Mrs. Gladys Morch and two like bonds to Nielson as security for loans which they had advanced to the business prior to the formation of the company. Those bonds, having been issued for a past consideration within three months of the commencement of the liquidation, were invalid. According to Morch a contract was obtained for the supply of about £800 worth of radio goods, but after about £300 worth had been supplied the buyers refused to take delivery of the remainder which were in stock in various stages of manufacture, with a consequent loss to the company. On May 21st, 1925, the debenture holders appointed Mr. C. T. Payne as receiver on their behalf. The failure of the company is attributed to trade depression and illness of the managing director, which prevented his giving the necessary attention to the company's business. In the opinion of the Official Receiver the failure is due to entire lack of working capital. The Official Receiver had disposed of the assets by public auction; the gross proceeds amounted to £245, which has been credited to a suspense account pending a decision of the debenture holders as to whether they will take action to establish the validity of their charge. Mr. Charles Latham, 78, New Oxford Street, W.C., has been appointed liquidator.

ANGEL SUPER SIGNS, LTD., Lichfield Grove Works, Finchley, N.—The creditors met recently and a statement of affairs was submitted which disclosed liabilities of £2,203 and net assets of £900, leaving a deficiency of £1,213. The company was incorporated in January, 1924, taking over the business previously carried on by Mr. Angel, Senr., and Mr. Jarvis. A balance sheet of the company for the year to January 31st, 1925, showed a turnover of £6,821, and a gross profit of £1,735, but after allowing for overhead charges, there was a net loss of £144. For the period to October 31st last the turnover was £5,446, on which a gross profit of £1,313 was made, but there was a net loss of £931. It was eventually decided to confirm the voluntary liquidation of the company with Mr. W. R. Clemens, C.A., as liquidator. A committee of inspection was also nominated.

NORTH BRITISH DIESEL ENGINE WORKS, LTD.—Winding up voluntarily. Liquidator, Mr. N. M. Lindsay, Clydeholm, Whiteinch, Glasgow.

BELGRAVIA ELECTRICAL CO., LTD.—A meeting of creditors is called for December 29th at the offices of Messrs. Annan, Dexter & Co., 21, Ironmonger Lane, E.C. Liquidator, Mr. W. H. Lovatt.

Dissolutions of Partnership.—ELECTRIC PUBLICITY CO., electric sign manufacturers, 7, Chichester Rents, Chancery Lane, W.C.—Messrs. S. Dallaway, H. Mundy, and G. F. S. Goodwin have dissolved partnership.

DYER & CO., electricians, decorators and dealers in wireless supplies, Park Road, Bingley.—Mr. W. P. Dyer and Mr. C. G. Snelgar have dissolved partnership. Mr. Dyer will attend to debts and continue the business under the same style.

A French Fair.—A Commercial and International Fair is to be held at Lille from April 2nd to 18th, 1926. Full details may be obtained from the Comité de la Foire de Lille, 73, Rue Faidherbe, Lille.

Change of Address.—The address of the Portsmouth Corporation Electricity Supply Department head office is now: High Street, Portsmouth.

Irish Free State Electrical Imports.—The official returns show that the imports of electrical goods into the Irish Free State during September last amounted to a value of £39,594, as compared with £22,853 in September, 1924. The total for the first nine months of the year amounted to £249,032, as against £220,774 in the corresponding period of last year. It should be noted that dynamos and other electrical machinery are not included in the foregoing figures.

New Belgian Companies.—A new company has just been formed at Molenbeek-St. Jean, Brussels (2, Chaussée de Ninove) with a capital of one million francs and the title La Société de l'Union Electro-technique to manufacture electric fans, bells, and measuring instruments.

La Société Générale des Forces Hydro-Electriques du Katanga has been formed in Brussels, with a capital of 75 million francs, to establish hydro-electric power stations in the Belgian Congo.

Unemployment.—The Employment Exchange returns for the week ended December 7th showed a total of 1,161,000 unemployed persons, as compared with 1,165,275 a week earlier, and 1,182,188 at the equivalent date of last year.

Calendars, Diaries, &c.—MESSRS. MEASUREMENT, LTD., of 118, City Road, London, E.C.1, have prepared a very neat gilt-edged pocket diary for 1926, with adequate daily space, a thumb index to months, and an alphabetical index to names and addresses.

We have again received from MESSRS. F. C. POLDEN & CO., LTD., one of their pocket books. This is handsomely bound in dark red leatherette and contains a diary having a double page for each week and ample memoranda space; a really serviceable article.

BRITISH INSULATED & HELSBY CABLES, LTD., has sent us a set of 1926 refill cards for its calendar.

From the POWER EQUIPMENT CO., LTD., we have had a wall calendar with bold-figured monthly sheets.

The calendar issued by MESSRS. JOHN ARMSTRONG & CO. (MANCHESTER), LTD., is graced by an unbobbed beauty in riding kit. The calendar is a block of daily slips.

MESSRS. J. SHAW, SON & GREENHALGH, LTD., have sent us a "Utility" calendar with a block of large-fiured daily slips.

MESSRS. COLLINS ELECTRICAL, LTD., have adopted the humorous style for their 1926 calendar. This consists of two-monthly date sheets, each bearing a coloured drawing.

From the KEY ENGINEERING CO., LTD., we have received a little celluloid slip combining the functions of a calendar and a rule, with English and metric measurements.

MESSRS. LINDSAY & WILLIAMS, LTD., have sent us a "Utility" calendar mounted in an omega—recalling the company's "Megohmoid" insulation.

The WALKER ELECTRICAL SERVICE (Edinburgh) is issuing a wall calendar with monthly slips and illustrations of repair work.

From MESSRS. POYNTER, GRIFFITHS & CO., LTD., of Maxim Lamp Works, Canonbury Road, London, N.1, we have received a wall calendar with small monthly slips placed beneath a picture demonstrating the illuminating qualities of the Maxim lamp and the charms of the damsel who holds it.

Mr. ERIC THOMPSON, of The Electric Shop, Thirsk, has sent us a wall calendar with monthly slips below a coloured study inducing pleasant recollections.

The calendar received from MESSRS. GEORGE NOBBS, LTD., has monthly slips and an illustration of an electrically-equipped bathroom.

RADIO INSTRUMENTS, LTD., has again sent us a copy of its diary. This contains a great deal of useful information on radio matters, including a list of British amateur transmitters.

MESSRS. T. J. GRAINGER & CO., LTD., of 20, Eldon Square, Newcastle-on-Tyne, have issued a large wall calendar with boldly figured daily slips.

Book Notices.—"Case-Hardening Practice" (32 pp., illustrated). Huddersfield: David Brown & Sons (Huddersfield), Ltd.—This brochure contains a very detailed report of researches carried out in the case-hardening of steel by the company's research staff. It is profusely illustrated with photo-micrographs.

"*Journal* of the Institution of Electrical Engineers." Vol. LXIV. No. 348. December, 1925. London: The Institution. Price 10s. 6d.

"Insulated Electric Cables. I. Materials and Design," by C. J. Beaver. Pp. 264; figs. 71. London: Ernest Benn, Ltd. Price 36s. net.

"The 'Bennis' Standard Evaporation Tables" (14 pp.). Compiled and calculated by G. A. Rossetti. Bolton: Messrs. E. Bennis & Co., Ltd. Price 2s. 6d. net.—These tables, based on Prof. Callendar's data, are designed to assist in the rapid and accurate determination of boiler outputs, efficiencies, fuel consumption, &c.

Electrical Prospecting.—In their report for the past year the directors of the Rhodesian Congo Border Concession, Ltd., state:—"Assisted by electric prospecting, which has proved most effective, making possible the accurate mapping of ore deposits which do not come to the surface, three additional ore bodies were discovered. These have been tested by drill holes with most satisfactory results."

Lighting and Power Notes.

Australia.—MELBOURNE.—According to the *Electrical Engineer of Australia and New Zealand*, the City Council has adopted a recommendation of the Electric Supply Committee for a reduction of the electric lighting tariff throughout the Council's supply area by ½d. per kWh during the summer months—October to March. The new rates are: First 1,000 kWh per month, 3d. per kWh; next 1,000 kWh, 2½d., all further consumption 1½d. per kWh. The reduction is made with a view to assisting shopkeepers and others who use large amounts of energy for lighting.

WESTERN AUSTRALIA.—It is reported that the Western Australian Government will introduce, at an early date, a Bill for the constitution of an Electricity Commission to take charge of electricity supply matters in the State.

Barnes.—ELECTRICITY SUPPLY.—With reference to the Urban District Council's proposal to extend the plant at its electricity works, a communication has been received from the Electricity Commissioners intimating that they are of opinion that the interests of consumers would best be served by the Council's acceptance of the terms offered by the County of London Electric Supply Co., Ltd., and not proceeding with extensions to its generating plant. The Council has considered the Commissioners' report and has voted against the proposal to take a bulk supply. Application is to be made for authority to extend the generating plant.

Bedford.—LOANS.—The Electricity Committee has decided to apply for sanction to loans of £20,000 for mains and £5,000 for transformers and switchgear.

Sanction has been given to the following loans:—New offices for the electricity undertaking, £2,300; adaptation of boiler house, £430; domestic apparatus, £3,000; meters, £5,000; evaporating plant, £1,000.

EXTENSION OF SUPPLY.—The Committee has recommended a scheme to supply electricity to Bromham village, at an estimated cost of £5,736.

Bexhill.—NEW PLANT.—The Town Council has received an intimation from the Unemployment Grants Committee of its approval of the installation of a 1,259-kW converter, with switchgear, &c., at the electricity works for the purpose of a grant. Application has been made to the Electricity Commissioners for sanction to the scheme and to the borrowing of the necessary loan to cover the cost.

Blean.—OPPOSITION TO SCHEME WITHDRAWN.—The Rural District Council has withdrawn its objections to the application of Messrs. Hunt for an Order to supply electricity in the Council's district.

Brighton.—ELECTRICITY IN BULK.—The borough electrical engineer is making arrangements to provide a bulk supply of electricity to the Shoreham and District Electric Lighting Co., Ltd.

LOANS SANCTIONED.—The Electricity Committee has obtained sanction to the following loans:—£2,225 for structural alterations to the North Road sub-station; £45,000 for mains and services; and £4,050 for mains and services in connection with the supply in the urban district of Portslade-by-Sea.

Continental.—CZECHO-SLOVAKIA.—The municipal authorities of Kaaden have recently established a hydro-electric power station to utilise the water power of the River Eger in Northern Bohemia. The plant, which works under a head of about 90 feet, comprises two Voith turbines coupled to generators, of 1,745 and 3,270 h.p. respectively. A third set of 4,080 h.p. is to be installed later. The distribution system is being connected up with the power station at the collieries of the Poldihutte at Komotau so that a reserve supply will be available in case of excessively dry periods reducing the water supply.

Darley Dale.—INQUIRY DECISION.—In connection with the inquiry held by the Ministry of Transport recently into the objections raised by local authorities and the residents of Darley Dale to the proposal of the Derbyshire and Nottinghamshire Electric Power Co., to erect overhead cables from Matlock to Darley Dale, the Ministry has given its decision in favour of the company's proposal.

East Ham.—MAINS EXTENSIONS.—The Electricity Committee is to carry out mains extensions at an estimated cost of £1,876.

Faversham.—ELECTRICITY SUPPLY.—The Town Council is to provide an additional cable to the works of Mexco, Ltd., for a further supply of electricity on condition that the firm guarantees a consumption of not less than 60,000 kWh per annum for five years. The Council is considering a new scale of charges for power consumers of more than 50,000 kWh per annum.

Hamilton.—ELECTRICITY SUPPLY.—From January 1st next the burgh's electricity supply will be taken over by the Town Council from Messrs. Edmundsons Electricity Corporation, Ltd., and the Electricity Committee has recommended reduced rates for lighting, heating, and power, which, however, have been postponed until the results of the past year's working have been ascertained. It is reported that two companies are prepared to submit schemes for a hydro-electric installation on the River Clyde.

Ilford.—ELECTRICITY IN BULK.—The Electricity Committee has considered the report of the chairman and the electrical engineer with reference to their interview with representatives of the County of London Electric Supply Co., Ltd., regarding the question of a bulk supply of electricity from the company, and has reported to the Council that, having regard to the increased maximum demand for a bulk supply of electricity from the West Ham Corporation and to the estimated requirements of the Council's electricity undertaking for the period 1926-1927, arrangements be made with the company for a bulk supply of electricity (required in excess of the increased maximum demand, *viz.*, 2,000 kW, from the West Ham Corporation) upon detailed terms to be agreed upon, and subject to contract and to the approval of the Electricity Commissioners.

Loughborough.—EXTENSION OF SUPPLY.—The extension of the cable to Nanpantan, at a cost of £2,420, has been approved by the Town Council.

Lowestoft.—LOAN.—The Town Council is applying for sanction to a loan of £2,000 for meters.

Ludlow.—PURCHASE OF UNDERTAKING.—The Town Council has come to an agreement for the acquisition of the undertaking of the Ludlow Electric Light Co., Ltd., for £7,000, and has applied for an Order authorising it to take over the undertaking.

New Zealand.—CHRISTCHURCH.—The report on the working of the municipal electricity undertaking (engineer: Mr. J. C. Forsyth) for the year ended March 31st last shows a total revenue of £146,546, as compared with £123,432 in 1923-24. Working expenses amounted to £33,561, as against £26,181, and the purchase of a bulk supply from the Lake Coleridge station of the Public Works Department £29,599 (£26,109). After deducting interest and other charges, there was a net profit of £14,320, as compared with £22,790 in the preceding year. The electrical energy sold increased from 18,979,956 to 22,511,181 kWh, and the maximum supply demanded from 5,640 to 6,460 kW. During the year five new sub-stations were put into operation, and 8¾ miles of l.p. overhead mains were erected, bringing the total to 218 miles. A loan of £375,000 has been arranged to cover anticipated extensions of the system during the next five to seven years.

Northern Ireland.—DONAGHADEE (CO. DOWN).—At a recent meeting of the Urban District Council a recommendation of the Finance Committee that tenders be invited for lighting the town by electricity or gas was adopted.

Peebles.—OPPOSITION TO ORDER WITHDRAWN.—The Town Council has withdrawn opposition to the application of the Galashiels and District Electric Supply Co., for an Order to supply electricity in the town.

Fort William.—BREAKDOWN.—The bursting of a cell at the accumulator house damaged dynamos and other plant at the generating station recently, and for a time the town was in darkness.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

PONTYPRIDD.—Ordinary lighting: From 6½d. to 6d. per kWh. Slot meters: From 7½d. to 7d. per kWh. Heating: Winter quarters—first 100 kWh, 2d. per kWh, all energy in excess, 1½d. per kWh; summer quarters—first 100 kWh, 1½d. per kWh, above this amount, 1d. per kWh. Large consumers who are prepared to take 500 kWh per quarter per kW demanded: Flat rate of 1½d. per kWh in the winter and 1d. per kWh in the summer.

BRIGHTON.—Lighting: First 10,000 kWh, from 5d. to 4½d. per kWh, the remaining sliding scale charges to be as at present. Power, heating, and cooking: Flat rate from 1½d. to 1d. per kWh. Street lighting: From 2d. to 1½d. per kWh. Tramway supplies: From 1.3d. to 1.2d.

LOWESTOFT.—Power: Varying from 2½d. to 1½d. per kWh, according to the quantity consumed.

BRADFORD.—Heating and cooking (except to consumers taking a supply on the rateable value system: From 1½d. to 1d. per kWh.

WOLVERHAMPTON.—The charges to be reduced from 33⅓ per cent. to 25 per cent., above the pre-war rates.

Skegness.—ELECTRICITY SCHEME.—The Finance Committee has recommended to the Town Council that the subject of a public supply of electricity be deferred for one year. The Council had decided to install its own generating plant.

South Devon.—INQUIRY DECISION.—In connection with the inquiry held in July last into two applications for authority to supply electricity in a large rural area of South Devon, the Electricity Commissioners have intimated that an Order has been granted to the Teignmouth Electric Lighting Co., Ltd., authorising it to supply electricity in certain villages.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Gwynedd Trust, Ltd., to supply electricity in parts of the rural districts of Gwyrfai and Ogwen, in the rural districts of Forden, St. Asaph, Holywell, and Congleton, the boroughs of Welshpool, Montgomery, Denbigh, and Flint, and the urban districts of Sandbach, Alsagar, and Holywell.

The Electrical Distribution of Yorkshire, Ltd., has applied for an Order authorising it to supply electricity in the urban district of Clayton.

Stoke.—EXTENSION OF SUPPLY.—The Electricity Committee has decided to supply electricity to the Abbey Hulton housing estate and is applying for sanction to a loan of £4,000 to cover the cost.

Sunderland.—ELECTRICITY EXTENSIONS.—The Corporation is to construct an underground switch chamber at the corner of High Street West and Bridge Street, at an estimated cost of £4,550. Extensions of mains are to be carried out at an estimated cost of £2,297, and application is to be made for an Order for the acquisition of land and buildings for the purpose of electricity works extensions.

STREET LIGHTING.—The Corporation has installed "Wembley" lanterns of 3,000 c.p. for the lighting of three main streets.

Swansea.—OPPOSITION TO ORDER.—It was reported at a recent meeting of the Town Council that the Llanelly and District Electric Supply Company, Ltd., had applied to the Electricity Commissioners for an Order authorising it to supply electricity to the Gorseinon Electric Light Company, Ltd., and that the Town Clerk had lodged objections to the application on the ground that the Gorseinon Company had an agreement with the Corporation by which "the Corporation shall supply such electrical energy as the company may from time to time require."

Turkey.—ELECTRICAL DEVELOPMENT.—According to the report of the Société Turque d'Electricité the power stations of the company in Constantinople produced during the last financial year 40,010,486 kWh, an increase of 5,603,806 kWh as compared with 1923-24, while the sales advanced from 27,626,175 to 33,408,983 kWh. The number of consumers increased from 30,228 to 32,752. Since June last the company has been supplying electricity to the suburbs of San Stefano and Sar Yar on the Upper Bosphorus and has entered into an agreement to give a supply to the Kadikeny Gas Co. on the Asiatic bank of the Bosphorus.

United States.—HYDRO-ELECTRIC DEVELOPMENT.—The New York correspondent of *The Times* reports that plans have been prepared for the development of water power on a large scale, along the Tennessee River. By building 100 dams on the river and its tributaries, it is calculated that it would be possible to develop at least 4,000,000 h.p. The machinery on the Wilson Dam at Muscle Shoals is now ready. The completion of

other dams higher up river will, it is believed, permit Muscle Shoals alone to develop 612,000 h.p., maintained steadily at all seasons. Four companies have already applied to the Federal Power Commission for permits to build 24 of the projected dams with an estimated development of a further 1,441,000 h.p.

Worthing.—SPECIAL ORDER.—The Electricity Commissioners have notified the Town Council that they propose to grant its application for a Special Order authorising it to extend the present area of electricity supply to Sompting, Findon, Angmering, and Rustington.

West Riding (Aire and Calder) Electricity District.—A deputation from the conference of local authorities in connection with the West Riding (Aire and Calder) Electricity District waited upon Sir John Snell in London recently in connection with the breakdown of the proposed scheme for a joint supply of electricity to the West Riding by the local authorities and the Yorkshire Electric Power Co., consequent on the withdrawal of the latter from the scheme. The proceedings were private, and no statement was issued.

Weymouth.—NEW PLANT.—The Electricity Committee has decided that the following plant and mains be installed, subject to the approval and consent of the Electricity Commissioners to obtaining the plant and extending the area of supply:—Two 20,000-lb. water-tube boilers; two 1,500-kW turbo-alternators; two 500-kW rotary converters; two 750-kVA transformers; together with the necessary auxiliaries in pipework, condensers, circulating-water system, buildings, foundations, &c. It is also recommended that h.p. mains be laid to Wyke and Upwey, together with the laying of the l.p. mains in these areas. The total estimated cost of the proposed work is £52,185 for generating plant, &c., and £22,977 for mains and sub-stations.

Tramway and Railway Notes.

Australia.—WESTERN AUSTRALIA.—We have received from Mr. W. H. Taylor, general manager of the Government tramway undertaking, a copy of his report, together with the statement of accounts, for the year ended June 30th last. The total income amounted to £281,612, as compared with £274,583 in the preceding year, and the working expenses were £236,008, as against £231,895, leaving a gross profit of £45,604 (£42,688). Interest charges absorbed £44,835, and there was a net surplus of £769, as compared with a loss of £155 in 1923-24. The number of passengers carried increased from 27,893,315 to 28,894,525, and the car-mileage from 2,989,089 to 3,040,505.

Continental.—ITALY.—The Milan-Sarrono line and the Bovisa-Meda section of the Milan-Erba line of the North Milan Railway Co. are to be electrified.

A contract has been concluded for the construction of an electric tramway, passing along the Mediterranean coast between Leghorn, Pisa and Marina-di-Pisa. It is intended to begin work early in the new year.—*Reuter's Trade Service* (Pisa).

PORTUGAL.—According to the *Railway Gazette*, the first railway to be constructed in Portugal, Cascaes-Caes do Sodrè, is now being electrified and the scheme is nearing completion. It is expected that the electrical service will be ready early in 1926.

SWITZERLAND.—Good progress is being made with the electrification of the Zurich-Meilen-Rapperswil section of the Swiss Federal railways, and it is expected that the work will be completed by May next.

Edinburgh.—TRAMCAR EQUIPMENT.—A sub-committee of the Corporation Tramways Committee has recommended that 25 sets of air brakes be purchased at a cost of £3,875.

Glasgow.—THROUGH RUNNING.—The Tramways Committee has decided not to proceed further with the proposed arrangement with the Lanarkshire Tramways Co. for reciprocal running powers on its tramways.

London.—NEW TUBE SERVICES.—The new tube extensions from Clapham to Morden and from Charing Cross to Kennington, *via* Waterloo, are scheduled to be in service next midsummer, and it is expected that 5,577 trains a day will serve the various termini of the Hampstead and City lines, together with their extensions. The operation of these services will entail the employment of about 300 additional men.

Manchester.—NEW DEPOT.—The *Daily Dispatch* reports that the Tramways Committee has accepted a tender for the construction of a car shed in Birchfields Road, Rusholme, at a cost of £150,000. It is expected that the work will provide employment for about 100 men for nine months, and that the depôt will be completed before next winter.

Manchuria.—NEW TRAMWAY.—It is reported that the Siemens-Schuckertwerke, of Berlin, has secured the contract for the construction and equipment of an electric tramway in the town of Harbin, North Manchuria.

Stoke-on-Trent.—INQUIRY.—An inquiry was held on December 15th by Mr. R. Tolerton, on behalf of the Minister of Transport, into an appeal by the Potteries Electric Traction Co. against a decision of the Corporation attaching conditions with respect to the routes upon which thirteen omnibuses belonging to the company might ply for hire. According to the *Birmingham Post*, the company asked for an Order that the thirteen omnibuses which are now running on country routes only might also be allowed to run on the main route through the six Potteries towns. Opposition was offered by the Corporation. Mr. Rowand Harker, for the company, said the grounds of the application were that it would facilitate the working of the traffic and give the company a fairer share of the main route traffic than at present, and so assist it in meeting its present difficult financial situation. Mr. R. J. Howley, chairman of the company, gave evidence that the effect of omnibus competition on the tramway undertaking had been very serious, the tramcars being now worked at a considerable loss. The company had a statutory obligation to run tramcars. Mr. Ward, for the Corporation, submitted that the number of omnibuses and tramcars now being run by the company showed that it had been treated fairly, but the district had an ample and adequate service to-day only because the licences were granted to private persons in opposition to the company.

The Minister's decision will be given in due course.

Telegraph and Telephone Notes.

Jugo-Slavia.—NEW RADIO STATION.—The Ministry of Posts and Telegraphs has authorised the erection of a wireless transmitting station at Agram (Zagreb), which will probably be opened by the first of March.—*Reuter* (Belgrade).

Marine Radio Operators.—STRIKERS' DEPUTATION.—Acting upon the advice of members at a meeting at the House of Commons, representatives of marine wireless operators approached both the President of the Board of Trade and the Minister of Labour seeking a personal interview. The reply from the Ministry of Labour stated that the Minister of Labour "regrets that he is not able at present to arrange to receive a deputation personally. An officer of the Department will, however, be prepared to see your Executive on December 21st." The reply from the Board of Trade states that the President "would be glad if you could send him a detailed statement of the points which you wish to raise."

Rugby Radio Station.—NOVEL FEATURES.—Dr. W. H. Eccles, vice-chairman of the Wireless Telegraphy Commission, points out in *The Times* that the hub of the Imperial radio communication scheme is the station at Rugby, which was designed by the Commission and the Wireless Section of the Engineering Department of the Post Office. The masts, power plant, auxiliary machinery, and thermionic valves have all been supplied by British contractors; the buildings have been erected by the Office of Works; the high-frequency circuits have been made and installed by the Engineering Department of the Post Office. The Commission, being unfettered in its choice of methods and apparatus, has been able to break away from standard practice and therefore the station "is full of novel features." Thermionic valves solely are used for generating the electrical waves, the sum total of the valve power amounting to about 1,500 kilowatts, three times as great as that of any other valve station. Of this equipment two-thirds will be used for Morse telegraphy and one-third will be reserved during the coming year for experiments in long-range telephony. Telegraphy will be conducted on both long and short waves, so that several messages may be sent simultaneously to various parts of the globe. The telephony plant has a range of more than 5,000 miles.

A unique feature is the fact that the waves radiated from the aerial have their origin in the vibrations of a tuning fork, which are magnified by stages, by banks of thermionic valves, till they reach the total of over 700 h.p. and pass to the aerial circuits. The fork thus governs the wavelength and keeps it rigorously constant. "Rugby is the first great station absolutely free from involuntary variations of wavelength and will revolutionise the methods of preventing interference between wireless services." This new method has been developed within the Wireless Section of the Post Office. During the preliminary trials quarter power reached Java and Hong-kong: half-power was heard well in Australia and very strongly in America; still higher power gave good signals in New Zealand and was reported "stronger than any other station" by South Africa, and was stated to give signals of "amazing clarity" in Sydney. The tests made in Rugby town, two miles from the station, to ascertain how far the concerts from the B.B.C. station at Daventry, 12 miles away, are interfered with by the Morse transmission at Rugby, proved that although Rugby was, at the time, using in its aerial about 25 times the power used in the Daventry aerial, there was no interference at all.

The Rugby station will start upon its Imperial mission as soon as range tests are completed, within two or three months. This all-round service will be supplemented by a "beam" service to each of the four largest Dominions as soon as the "beam" stations have passed similar tests. In the meantime the long- and short-wave equipment at Rugby will ensure satisfactory transmission to every part of the Empire throughout the 24 hours, says Prof. Eccles.

Turkey.—SMYRNA TELEPHONE CONCESSION.—Under a contract signed by the Minister of the Interior on behalf of the Turkish Government, a concession has been granted to the municipality of Smyrna for the installation and operation of a telephone system for a period of 35 years. Service will be provided for 2,000 subscribers. The installation must be completed in the city itself within a year and three months after the capital is procured, and within two years in the suburbs.

Radio Notes.

Finland.—BROADCASTING COMPANY.—At a meeting held on December 12th a number of companies and private persons interested in broadcasting in Finland decided to form a joint stock company to make arrangements for broadcasting in Finland. The company will probably begin its activity on January 1st.—*Reuter's Trade Service* (Helsingfors).

Licences.—SCOTTISH PROSECUTIONS.—As a result of the "examination of suspected premises" 600 summonses have been issued against residents in Aberdeen who are suspected of possessing unlicensed broadcast receiving sets. According to the *Daily Express*, the prosecutions are based on the possession of aerials, either of the indoor or outside types, which are capable of reception.

LONDON CONVICTION.—Mr. Arthur Plowman, of Kentish Town, was fined 10s. at the St. Marylebone Police Court on December 18th for installing wireless apparatus without having purchased a licence. It was stated that the Postmaster General considered it necessary to prosecute in all such cases.

Radiophony Union.—BRUSSELS CONFERENCE.—The International Broadcasting Conference has decided to proceed with systematic tests based on a scheme submitted by the Technical Committee in order to ascertain the best method of lessening interference between the large number of European stations. In view of the urgency of the matter, a technical sub-committee has been appointed, of which Captain P. P. Eckersley is a member, which is to meet shortly and draw up a programme for the proposed tests.—*Reuter* (Brussels).

The congress sat under the presidency of Rear-Admiral C. D. Carpendale (Great Britain), France, Germany, Holland, Czecho-Slovakia, Spain, Norway, Sweden, Austria, Italy, and Belgium each sent delegates, while the International Radio Office was represented by Mr. A. Burrows.

Switzerland.—BERNE STATION.—The inaugural transmission from the Berne broadcasting station, which took place on November 19th, was successfully received in Great Britain, all over Switzerland, Italy, Portugal, Germany, France, Czecho-Slovakia, Belgium, and even as far away as Argentina, where the transmission was very good. In view of the fact that the country surrounding the Berne station is of a mountainous nature, the reports of reception are very satisfactory. The station has a Marconi 6-kW transmitter, similar to the apparatus used in the majority of British stations and the building also contains the two telegraph transmitters for services "*Via Marconi*" between Great Britain and Switzerland, but the close proximity of the sets produces no mutual interference. The two telegraph transmitters operate simultaneously at high speed on one aerial, and an independent aerial has been erected for the broadcast transmitter, which operates on 302 metres.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—April 19th, 1926. State Electricity Commission of Victoria. Plant for the Sugarloaf and Rubicon hydro-electric scheme, consisting of turbo-generators, transformers, switchgear, cranes, and accessory plant. (December 11th.)

Victorian State Railways. January 13th. Double recording wattmeter.* January 20. Automatic battery-charging equipment.*

Ayrshire.—December 31st. Education Authority. Electrically wiring the extension to Ochiltree school. Specifications from Mr. Wm. Reid, master of works, Education Offices, Ayr.

Beckenham. — January 14th. Electricity Department. Water-heating and softening plant. (December 18th.)

Birmingham.—January 9th. Tramways Committee. 50 tramcar bodies. Forms of tender (£2) from Mr. A. Baker, general manager, Tramways Offices, Birmingham.

Brentwood.—January 1st. Guardians of Billericay Union. Electrical wiring in conduit and installation of complete electric generating plant at the Institution, Billericay. (December 11th.)

Dublin.—December 29th. Commissioners of Public Works. Installation of electric lighting at the Irish Land Commission Offices, Upper Merrion Street, Dublin. Specification (20s.) from the Secretary, Office of Public Works, Dublin.

Dundee.—January 14th. Electricity Department. Two electrically-driven centrifugal drainage pumps controlled by float gear. (December 18th.)

Town Council. Electric lighting installation at day nursery, North George Street. Particulars from Mr. G. Baxter, city engineer.

Edinburgh.—January 4th, 1926. Electricity Supply. Two 1,200-b.h.p., 6,600-V, 3-ph. induction motors. (December 11th.)

Edmonton.—Education Committee. Wiring offices at Brettenham Road, Edmonton, for electric light. (December 11th.)

Egypt.—CAIRO.—February 20th. Director-General, Mechanical Department, P.W.M. Power Plant for Giza.

January 20th. Local Commissions Section. Elector motor and accessories at Manfalout waterworks.*

KHARTOUM.—March 15th. Inspector-General of Irrigation, Sudan. Travelling and overhead cranes, dynamos, motors, and storage batteries for the equipment of the irrigation dock at Rabak, on the White Nile. Specification from the Inspector-General of Irrigation, Sudan, Khartoum.—*Reuter's Trade Service* (Cairo).

London.—LONDON COUNTY COUNCIL.—December 31st. Renewal of the storage battery at Bexley Mental Hospital. (December 11th.)

CAMBERWELL.—January 11th, 1926. Borough Council. Stores, including electric lamps, for 12 months. Particulars from Borough Engineer, Town Hall, Camberwell.

METROPOLITAN ASYLUMS BOARD.—December 30th. Installation of fire-alarm system at Tooting Bec Hospital. (December 18th.)

LAMBETH.—January 5th. Board of Guardians. Twelve months' supply incandescent electric lamps. (See this issue.)

SHOREDITCH.—January 27th. Electricity Department. One 50,000-lb. water-tube boiler, with economiser, forced and induced draught, &c.; one 10,000-kW turbo-alternator, with condenser, pumps, &c. (See this issue.)

BETHNAL GREEN.—January 19th. Board of Guardians. Three Lancashire boilers for the Hospital, Cambridge Road. Specifications, &c., from Mr. C. F. Jones, clerk to the Guardians, Bishops Road, Bethnal Green, E.

Manchester.—December 30th. Electricity Committee. One single unit (or, alternatively, one double unit) three-phase induction regulator (December 11th.)

Two 1,000-kW and seven 750-kW motor converters, or, alternatively, rotary converters and static transformers. (December 18th.)

January 12th. Tramways Committee. Steel girder tramway rails. Mr. H. Mattinson, general manager and chief engineer, 53, Piccadilly, Manchester.

January 6th. Board of Guardians. Electric lighting installation at the pathological and dispensing block, Crumpsall Infirmary. Specifications from Mr. A. J. Murgatroyd, architect, 23, Strutt Street, Manchester.

New Zealand.—WELLINGTON.—February 16th. Public Works Department. Outdoor switchgear for the Waikato electric power scheme.*

March 2nd. Synchronous condenser and transformers for the Arapuni electric power scheme.*

30,000-V switch and protective apparatus for Lake Coleridge electric power supply.*

AUCKLAND.—February 8th. Auckland Electric Power Board. Overhead cotton-covered triple-braided cable.*

February 22nd. 15-amp. cut-outs.*

DUNEDIN.—February 26th. Otago Harbour Board. Motors, control gear, and cable.*

Preston.—January 15th. Electricity Department. Supply and erection of approximately 15 miles of 33,000/45,000-V double transmission lines. (December 11th.)

Slaithwaite.—No date. Electric light installation at the Co-operative Hall, Carr Lane, for Slaithwaite and District Co-operative Society, Ltd. Specifications from the Society's offices.

South Africa.—JOHANNESBURG.—January 28th, 1926. S.A. Railways and Harbours. Eleven 4-ton electrically-driven wharf jib cranes and seven electric capstans for Durban Harbour. Secretary to the Tender Board, S.A.R. Headquarters, Johannesburg.*

January 21st. Municipal Council. 106 current transformers.*

February 26th. Motor-driven air compressor, with electrical equipment.*

CAPE TOWN.—January 27th. Electricity Department. Oil-cooled transformers.*

UNION TENDER BOARD.—January 28th. Miscellaneous telegraph and telephone materials for the Department of Posts and Telegraphs.*

Uruguay.—February 23rd, 1926. State Electricity Supply Works. Porcelain insulators and accessories.*

D.c. and a.c. meters.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Ashtead.—City of London Schools Committee. Recommended. Re-wiring at orphan school premises.

H. E. Keen & Co. (Recommended.)	£757
F. Polden & Co., Ltd.	783
V. G. Middleton & Co.	1,175
Higgins & Griffiths, Ltd.	1,219

Australia.—SYDNEY.—Electricity Supply Committee. Recommended:—

Fibre conduits (£4,934).—Western Electric Co. (Aust.), Ltd.
L.p. shackle insulators (£433).—New South Wales Insulator Works.

NEW SOUTH WALES.—Railways Department. Accepted :—
Equipment for Lakemba (Belmore) and Gordon sub-stations (£21,439).—Australian General Electric Co., Ltd.
Electric travelling jib crane for White Bay power house (£2,858).—Gibson, Battle & Co., Ltd.
72 D.K. traction motors (£19,586).—English Electric Co., Ltd.

MELBOURNE.—Victorian Railways. Accepted :—
Overhead electrical equipment, at rates.—British Insulated & Helsby Cables, Ltd.

State Electricity Commission of Victoria.
Switchgear and accessories (£870).—Ferguson, Pailin, Ltd.

Commonwealth Postmaster-General's Department, Victoria.
Insulators.—R. Fowler, Ltd (£5,100); Firebrick Insulator & Pottery Co. Pty., Ltd. (£5,674); Calyx Porcelain Co., Ltd. (£3,921).
Telephones, all states (£22,733).—British L. M. Ericsson Tel. Mfg. Co., Ltd.
Transformers (£6,965).—Western Elec. Co. (Aust.), Ltd.

—Tenders.

Bexhill.—Electricity Committee.
Battery booster (£295).—Bruce Peebles & Co., Ltd. (accepted.)
500 yd. of 3-core cable (£94).—British Insulated & Helsby Cables, Ltd. (recommended).

China.—SHANGHAI.—Shanghai Electric Construction Co., Ltd. Accepted :—
50 motors for trackless trolley 'buses.—E. R. & F. Turner, Ltd.

Epsom.—Urban Council. Accepted:—
Renewal of battery, &c. (£794, less £50 for old material).—D. P. Battery Co., Ltd.

Lamp Contracts.—The British Thomson-Houston Co., Ltd., has received contracts for the supply of "Mazda" electric lamps from the Great Western Railway Co. and the Pacific Steam Navigation Co.

Leyton.—Electricity Committee. Accepted:—

	Two traction motor converters.		Two general supply motor converters.	
	Speed.	Amount.	Speed.	Amount.
		£		£
Ateliers de Constructions Electriques de Charleroi ...	600	6,460	600	6,960
British Thomson-Houston Co., Ltd. (Accepted.)	**750**	**6,753**	**750**	**7,732**
General Electric Co., Ltd. ...	750	6,753	600	8,501
			500	9,348
Bruce Peebles & Co., Ltd. ...	750	6,754	600	8,310
			500	9,132
English Electric Co., Ltd. ...	750	6,753	600	9,359

London.—ST. MARYLEBONE.—Electricity Committee.
Three integrating meters, with transformers, &c. (£195).—Chamberlain and Hookham, Ltd.

STEPNEY.—Electricity Committee.
2 tons plumber's solder, ½ ton tinman's solder, and ½ ton blowpipe solder (£318).—G. W. Neale, Ltd. (accepted).
50 T/C disconnecting boxes (£107).—Universal Electrical Mfg. Co., Ltd. (recommended).
50 single disconnecting boxes (£59).—W. Lucy & Co., Ltd. (recommended).
4 tons sheet lead (£146).—G. Farmiloe & Sons, Ltd. (accepted).
30 tons pitch (£134).—Smart's Tar Distillery, Ltd. (accepted).

Luton.—Offices Committee. Accepted:—
Internal telephone installation at Council offices (£200).—Standard Telephones & Cables, Ltd., London.

Peterborough.—Town Council. Accepted:—
Extensions to the generating station (£79,950).—Mitchell Conveyer and Transporter Co.

Housing Committee. Accepted :—
Wiring Council houses (£725).—Peterborough General Engineering Co.

Stoke-on-Trent.—Hospital Committee. Accepted:—
Electric lighting installation, Bucknall Hospital wards (£192).—Hawley and Ingram.

Electricity Committee. Accepted :—
Two air extractors (£491).—Metropolitan-Vickers Electrical Co., Ltd.

York.—THE TURBO-ALTERNATOR CONTRACT.—According to the *Yorkshire Herald*, the Electricity Committee is holding up the decision to purchase Swiss electrical plant. As mentioned in our issue of December 11th, page 942, the Council decided to approve of the recommendation of the Electricity Committee to purchase Swiss machinery for £19,000 in preference to British plant, the lowest tender for which was £24,000; the voting was 23 votes for and 16 against.

The *Yorkshire Herald* states that, with the exception of the Rev. G. S. Woods, who is the chairman of the York Labour Party, the whole of the Labour members present at the meeting voted with the majority in favour of the recommendation. The majority decision has roused opposition among the citizens, and it is believed the Electricity Committee, having concluded that it ought not to spend £19,000 on foreign machinery, unless it has the full approval of the Council, will seek to raise the whole question at a further meeting.

Forthcoming Events.

Salford Technical and Engineering Association.—Saturday, December 26th. At the Royal Technical College. From 5.30 to 11.45 p.m. Annual social.

Junior Institution of Engineers.—Friday, January 1st. At 39, Victoria Street, S.W. At 7.30 p.m. Kinematograph lecture, "The Manufacture of Ordnance" and the "Rolling Mills and Crucible Melting Department at the River Don Works of Vickers, Ltd."

Electrical Power Engineers' Association.—Friday, January 1st. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 7 p.m. Lecture on "Automatic Boiler Control," by Mr. H. W. Holland.

Notes.

The Electrical Industry and Exhibition Policy.—An important meeting was held in London last week to consider in a preliminary way the subject of future electrical exhibitions and exhibition policy. It was convened by Mr. J. W. Beauchamp, Director of the British Electrical Development Association, and every section of the industry was represented through the various organisations. About fifty gentlemen were present and the ground covered in the course of the discussion concerned such matters as large exhibitions (along B.E.A.M.A. lines) and the frequency with which they should be held; the value of the smaller exhibitions in connection with which the B.E.D.A. renders such valuable assistance in all parts of the country; and the need for giving electrical support to the British Industries Fair until it became as big an event as the Leipzig Fair.

While nothing particular was decided on any of these points, something definite emerged in the shape of a liaison committee, connecting up all organisations concerned, which is to meet and discuss general principles and report to later meetings.

Appointments Vacant.—Assistant engineer, for the Lyme Regis Borough Council; switchboard attendants for Newport Corporation electricity department; senior lecturer in engineering for Cape Town Technical College; rolling stock and works superintendent (£300+) for the Wallasey Corporation tramways and motors department; clerk (£149) for the Beckenham U.D.C. electricity department. (See our advertisement pages to-day.)

Electric Lighting Demonstrations.—The second meeting of the Illuminating Engineering Society was held at the E.L.M.A. Lighting Service Bureau on December 16th, when Mr. C. W. Sully, Director of the E.L.M.A., presided. The report of the committee on "Progress in Electric Lamps and Lighting Appliances" was read by Mr. Hughes. Reference was made to the most recent B.E.S.A. specification for electric lamps and to recent lighting progress founded upon the work of the E.L.M.A. Lighting Service Bureau and the national campaign carried out by it in favour of better shop lighting. It was recalled that new provincial centres of the Association had recently been established in the Glasgow and North-East Coast districts. Following the presentation of the report Mr. W. E. Bush and Miss F. Hodges gave demonstrations of the shop-lighting and domestic-lighting displays, features of the Lighting Service Bureau which were described in our issue of September 18th last. The demonstrations were well attended and an animated discussion followed. A vote of thanks to the E.L.M.A. and to Mr. Sully terminated the proceedings.

Local Societies.—At Nottingham, on November 23rd, Mr. M. A. Crosbie, O.B.E., delivered the third lecture of the 1925-26 session of the Nottingham Society of Engineers. His subject, "Factory Equipment," covered the handling and separation of materials, mixing and refining, plodding and extruding, and weighing and measuring of small quantities.

At the Engineering and Scientific Club, Wolverhampton, on December 11th, Mr. F. H. Rosencrants, B.Sc., lectured on the development of powdered fuel in America and this country for the generation of steam for power purposes. Whilst in this country there are few boiler units at work with a capacity of 100,000 lb. of steam per hour, Mr. Rosencrants gave particulars and illustrations of many units working in the United States having a capacity of 200,000 lb. and 300,000 lb. of steam per hour; at the Ford Car works there are several boilers of this size, which, after the completion of certain alterations now being effected, will have a steaming capacity of 500,000 lb. per hour. An important feature of these large units is the simplicity of control, only one man being required to control four of them. It is claimed that owing to the perfect combustion and refinements of powdered-fuel installations, efficiencies of 89 to 91 per cent. are being maintained in daily working.

Mr. S. T. Allen and Mr. J. Hargrove took part in the discussion, and Major S. J. Thompson, who presided, proposed a vote of thanks.

Contributions to Research.—The Swansea Town Council, on December 16th, approved of a contribution of £25 towards the expenses of the research work carried out by the I.M.E.A. Such payments fall within the scope of the powers of sanction conferred upon the Electricity Commissioners by the Act of 1919.

The Need for Salesmanship.—Writing in the current issue of the *Journal* of the Leeds Chamber of Commerce, Mr. A. M. Samuel, Parliamentary Secretary to the Department of Overseas Trade, emphasises the need for good salesmanship if export markets are to be found for our goods. Referring to the services offered by his Department, he says that, while the overseas officers could not act as commercial travellers, they can and do help in the appointment of suitable local agents. Adequate personal contact with customers is necessary, and principals of firms should make a point of visiting them. Where the expense of individual representation in a market cannot be justified, Mr. Samuel considers that co-operative representation should be considered.

Explosion at Barking Power Station.—Whilst going to Press we learn from the *Essex Weekly News* that a turbine at the Creeksmouth power station of the County of London Electric Supply Co., Ltd., exploded on Monday last week, and that three employés, named Reid, Leaford, and Higgins, were seriously injured and were removed to hospital.

Technical Films.—The South Midlands Students' Section of the Institution of Electrical Engineers is holding an exhibition of technical films on January 11th at the Birmingham Temperance Hall, Temple Street, Birmingham, at 7 p.m., when a selection from the following list will be shown: A History of Electricity, entitled "From Coal Heap to Consumer" (E.D.A.); The Manufacture of a 50,000-kW Turbo-Alternator (Parsons); The Manufacture of Telephone, Rubber and Submarine Cables (Siemens); Electricity in a Steel Works; "The Story of Cotton"; The Panama Canal; The Manufacture of Tin-plate (B.T.-H.); The Osram Lamp Works (G.E.C.); Telephone Inventors of To-day; "On the Air"; and The Audion (Western Electric). We are informed that the Committee offers a welcome to any of our readers who care to attend the exhibition.

Fatality.—At the Manor Colliery, Stirling, on December 15th, Fred Grieve (14), residing in Stirling, was killed by electric shock while working at a washer at the pithead.

The Institute of Transport.—EXAMINATIONS.—The Council of the Institute announces that the last date for the receipt of applications for partial exemption from the Graduateship and Associate Membership examinations is December 31st, 1925. Applications should be addressed to the Secretary of the Institute, 15, Savoy Street, London, W.C.2.

Electricity Supply Progress During 1925.—Whilst, as the Electricity Commissioners remarked in their fifth annual report, considerable delay has resulted from the postponement of the Cabinet decision with regard to the Weir Committee's report, it would be very far wide of the facts to infer that no progress had been made during the year. Such an impression may cause hesitation amongst individuals in relation to schemes for electricity supply, and therefore it is worth while to demonstrate that such hesitation has not been shared by all parties.

For instance, it is satisfactory that the London and Home Counties Joint Electricity Authority has been established, and also that we may look forward to the setting-up of the West Midlands Joint Electricity Authority early in 1926.

In addition to these two Electricity District Orders, Parliament has also approved during the year over 20 Electricity Special Orders creating new undertakers, as well as numerous Electricity (Extension) Special Orders for existing undertakers. Whilst these were being approved, further applications were lodged by various authorised undertakers for extensions of their areas; and certain local authorities, companies, and persons have applied for statutory powers for electricity supply.

Apart from the (Extension) Special Orders which have been confirmed, and applied for, during 1925, the following are some of the new undertakers who have been added to the list during the year:—The Corporations of Calne, Clitheroe, Lichfield and Newark; the Urban District Councils of Ashford, Ashton-in-Makerfield, Bredbury and Romiley, Crediton, Grange, Guisborough, Padiham, Preesall, Prestatyn, Stanley, Tanfield and Ulverston; and the Rural District Councils of Penybont and Wirral; as well as several new companies.

The following are some of the would-be undertakers who have applied for powers during 1925:—The Corporations of Brecon and Richmond; the Urban District Councils of Bolsover, East Dereham, Gainsborough, Millom, Porthcawl, and Spalding; and the Rural District Councils of East Preston and Wrexham.

Fire. — Early in the morning of December 18th, fire destroyed the wireless experimental station of Capt. P. P. Eckersley, chief engineer of the B.B.C., at Hendon. It contained many data and much valuable short-wave apparatus, but was not officially connected with the British Broadcasting Co., Ltd.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

Mr. PERCY HUNTER, Commonwealth Director of Immigration, has been appointed general manager in Sydney of the Pacific Cable Board. According to the *Daily Telegraph* "the staff have informed the Board that they possess complete confidence in Mr. Robert Sutherland Bain, who has been acting manager at the headquarters in Sydney for four years with conspicuous success."

Alderman Mrs. HAMMER, chairman of the Electrical Association for Women, has just been elected vice-chairman of the Hackney Electricity Committee. To her, therefore, belongs the distinction of being the first woman to hold such a position.

Mr. O. G. LEE, contract manager of the Liverpool telephone district, has been appointed district manager of telephones for the Southampton district.

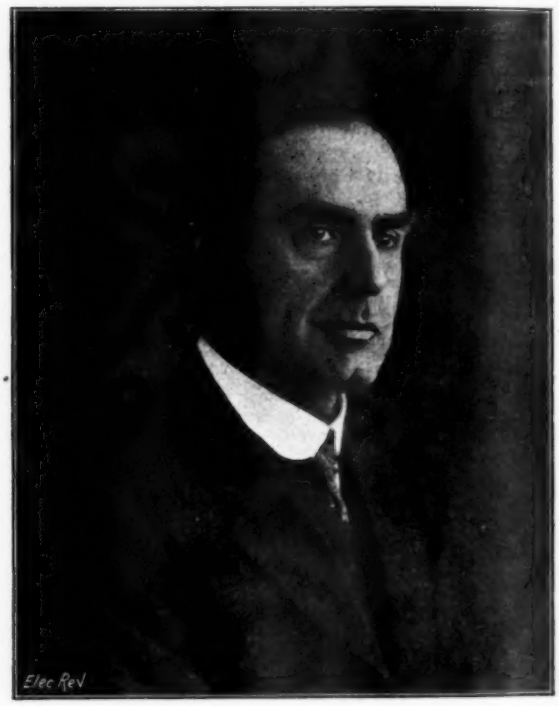
Mr. W. HOWE, telephone manager of the Southampton district, on retiring from the service has been presented by the district manager's staff of the Hants. and Dorset district with an inlaid mahogany combined barometer and thermometer and a set of books. Mr. Howe has spent 45 years in the telephone service.

Stoke Newington Borough Council Electricity Committee recommends the payment to Mr. H. LARGE, acting borough electrical engineer, of £125 for extra duty performed by him during the absence of the borough electrical engineer up to November 30th. The Committee has appointed Councillor J. LITTEN chairman and Councillor C. F. HELLIAR vice-chairman for the ensuing year.

We read in the *Electrical World* that Mr. JAMES M. WAKEMAN, who was for many years associated with that journal as vice-president and general manager, and subsequently spent from 1910 to 1913 in quest of health, after which he held for eight years the position of general manager of the Society for Electrical Development, has just returned to the United States after an absence of 16 months travelling in England, Scotland, France, and Italy.

Mr. W. H. COLLIS, on retiring from the position of deputy resident electrical engineer to the Liverpool Corporation, has been presented with a silver salver. Mr. Harold Dickinson, city electrical engineer, made the presentation. He has been connected with the Corporation Electric Supply Department for 37 years.

We reproduce herewith a portrait of Mr. E. EDWARDS, chairman of the Tees-side Sub-Centre of the Institution of Electrical Engineers. Mr. Edwards was educated at the Oswestry Grammar School and the Municipal College of Technology, Manchester. He served an apprenticeship with the British Westinghouse Co., Manchester, and then joined the Kent Elec-



M. Wright] [*Middlesbrough*

Mr. E. Edwards,

Chairman of the Tees-side Sub-Centre of the I.E.E.

tric Power Co. Subsequently, for a period of 12 years, he was connected with the Cleveland and Durham Electric Power Co. and the Newcastle-upon-Tyne Electric Supply Co. He was then appointed chief electrical engineer at the Acklam works of Messrs. Dorman, Long & Co., Ltd., a position which he still occupies.

Brevet-Colonel E. ROBINSON, who has just retired from the command of the Tyne Electrical Engineers (Territorial Army), was associated with that corps for many years. He was commissioned more than 20 years ago in the regiment, got his captaincy in 1903, majority in 1911, and from second in command was promoted lieutenant-colonel commanding in June, 1916, and received his brevet step in February, 1921. Colonel Robinson holds the Order of the British Empire for his services during the late war.

The command of the above-named corps has gone to Lieut.-Colonel N. H. FIRMIN, O.B.E., promoted from major and second in command. Lieut.-Colonel Firmin was commissioned in 1909, was promoted lieutenant in 1911, captain in 1915, and reached field rank in 1916. He rendered very valuable services during the late war, which were recognised by the King conferring on him the Order of the British Empire.

The Liverpool University Council last week appointed Associate-Professor F. J. TEAGO, D.Sc., M.I.E.E., to the Robert Rankin Chair of Electrical Machinery.

Mr. P. K. TURNER has retired from his position as Editor of *The Wireless Trader* in order to take up an important appointment in the research department of Burndept, Ltd.

Mr. A. S. BLACK, who opened the Edinburgh sub-branch of the General Electric Co., Ltd., in 1920, has recently been appointed assistant Scottish manager at the Glasgow branch. Mr. Black has now spent fifteen years with the company.

Obituary.—SIR GEORGE GIBB.—We regret to record the death of Sir George Stegmann Gibb, which occurred on

December 17th at the age of 75 years. Sir George, who was born in Aberdeen, was articled to a solicitor, and he was appointed solicitor in 1882 to the North-Eastern Railway, of which in 1891 he became general manager, a position which he held until 1906, following as a director for the next four years. In 1903 he was a member of the Royal Commission on London Traffic, and in 1906 when he left the N.E.R. he came to London as chairman of the Metropolitan Railway and managing director of the Underground Electric Railways Co. of London, Ltd. This occupied Sir George until the year 1910, when he became chairman of the Road Board, an office which he held until 1919. He served the railway and national interests in many excellent ways both as an arbitrator on wage matters and as an organiser. He was created a knight in 1904.

MR. ERNEST BENEDICT.—We have to record the death, at the age of 8" years, of Mr. Julius Felix Ernest Charles Benedict, M.Inst.C.E. Mr. Benedict was engaged in connection with railway engineering work in India and in this country for very many years. He was subsequently connected with technical journalistic work and was secretary of the Tramways and Light Railways Association from 1901-1906.

MR. G. A. MILLER.—Mr. George A. Miller, chairman of Messrs. W. H. Willcox & Co., Ltd., of Southwark, passed away on December 13th in his 76th year, at his residence in London. Mr. Miller joined the firm of W. H. Willcox & Co., Ltd., some 40 years ago, after having been previously connected with Sir W. H. Bailey & Co., Ltd., of Manchester.

Ald. W. F. COOKE, J.P., Mayor of Nelson, whose death took place on December 16th, was an assiduous chairman of the Electricity Committee. His services as representative on the Mid-Lancashire Electricity Committee and the Mid-Lancashire Advisory Board were much appreciated.

Wills.—The late Captain M. H. P. RIALL SANKEY left £12,538 gross and £1,087 net personalty.

COL. SIR ADAM BECK, of London and Ontario, left £6,139 presumably in this country.

New Companies Registered.

Power Auxiliaries Co., Ltd. (210,404).—Private company. Registered December 16th. Capital, £7,500 in £1 shares (3,750 "A" and 3,750 "B" ranking *pari passu* in all respects as to both capital and dividend). Objects: To acquire the goodwill and trade marks of the Power Plant Auxiliaries Company, with or without any of the other assets of that business, to adopt an agreement with W. S. A. Backhouse, and to carry on the business of engineers, specialists in boiler efficiency, boiler makers, iron and brass founders, millwrights, machinists, manufacturers of cotton, flax, and hemp, rope and twine, wire and wire rope, electric cables and wire, metallurgists, electrical engineers, &c. The first directors are:—W. S. A. Backhouse, 116, Cheadle Road, Cheadle Hulme, Cheshire, engineer (permanent); P. Backhouse, Glendarnel, Thorley Lane, Timperley, Cheshire, merchant; A. F. Walker, "Glenferry," Regent Road, Altrincham, Cheshire, secretary. The holders of the "A" shares are entitled to appoint two directors, and the holders of the "B" shares shall, so long as W. S. A. Backhouse is a permanent director, be entitled to appoint one director, but when W. S. A. Backhouse ceases to be a permanent director, then the "B" shareholders shall be entitled to appoint two directors. Qualification of permanent director, 1,000 shares; of other directors, £100. Remuneration as fixed by the company. Solicitors: Addleshaw, Sons and Latham, 15, Norfolk Street, Manchester. Registered office: 1a, Marsden Street, Manchester.

Unique Wireless Co., Ltd. (210,330).—Private company. Registered December 12th. Capital, £5,000 in 4,800 10 per cent. preference shares of £1 and 4,000 deferred shares of 1s. Objects:—To adopt an agreement with W. H. Sayers, L. S. Allen, and A. B. Ferguson, and to carry on the business of manufacturers of wireless or radio apparatus, component parts, complete sets, dry batteries, accumulators and wet batteries, static eliminators, wave-meters, wave traps, aerials, valves or thermionic tubes, &c. The first directors are:—W. H. Sayers, 209, Croxted Road, West Dulwich, S.E., engineer; L. Sandeman-Allen, "Goose Green Cottage," Pirbright, Surrey, insurance broker; A. B. Ferguson, 5, Catherine Road, Surbiton, insurance broker. Remuneration as fixed by the company. Secretary: S. C. Warren.

Maldon Electric Works, Ltd. (210,444). — Private company. Registered December 17th. Capital, £7,000 in 5,000 5 per cent. cumulative preference and 2,000 ordinary shares of £1 each. Objects: To acquire the business of electrical and other engineers carried on by Cooper and Smith, Ltd. The subscribers (each with one preference share) are:—T. Cooper, Spring Valley, St. Albans, chartered civil engineer; L. G. Cooper, Redcliffe, Orpington, Kent, member of London Stock Exchange. L. G. Cooper signs as a director. Solicitors: Mackrell & Co., 21, Cannon Street, E.C.4. Registered office: Station Road, Maldon, Essex.

Collinge & Corrigan, Ltd. (210,341).—Private company. Registered December 14th. Capital, £1,000 in £1 shares. Objects: To acquire the business of electrical engineers now carried on by F. Collinge and J. G. Corrigan at Leicester Street, Southport, as "Collinge and Corrigan," and to carry on the same and the business of motor engine makers and dealers in wireless receiving sets and apparatus, &c. The permanent directors are:—F. Collinge, 83, Tithebarn Road, Southport; J. G. Corrigan, "Rodona," Moss Road, Halsall, near Ormskirk. Qualification, 100 shares. Remuneration as fixed by the company. Registered office: 7, Tower Buildings, Leicester Street, Southport.

Vincent Switchgear Manufacturing Co., Ltd. (210,331).—Private company. Registered December 12th. Capital, £10,000 in £1 shares. Objects: To acquire the business now carried on by F. W. Abbott at Sampson Road North, Birmingham, as "Vincent Switchgear Manufacturing Co.," and to carry on the business of manufacturers of switchgear and electrical accessories, mechanical engineers, electricians, &c. The subscribers (each with one share) are:—F. W. Abbott, Sampson Road North, Birmingham, electrical engineer; Miss M. L. Abbott, "Ruthergien," Church Road, Yardley. F. W. Abbott is the permanent governing director. Solicitors: Huggins & Co., 63, Temple Row, Birmingham.

Watson Jones, Ltd. (210,435).—Private company. Registered December 17th. Capital, £10,000 in £1 shares. Objects: To adopt an agreement with H. R. Watson, A. E. Jones, and W. G. Bowditch, and to carry on the business of dealers in electrical, wireless and scientific goods and instruments as formerly carried on by the said parties at St. Stephen's House, Victoria Embankment, Westminster. The first directors are:—H. R. Watson, 33, Effra Road, Wimbledon, S.W., engineer (managing director); A. E. Jones, 33, Effra Road, Wimbledon, S.W., engineer; W. G. Bowditch, 1, Chatsworth Gardens, Acton Hill, W.3, merchant; F. C. Eckford, 39, Foulser Road, Tooting, S.W.17, engineer, each of whom may retain office for seven years. Qualification, £50. Remuneration, £5 per annum. Registered office: 32, St. Stephen's House, Westminster, S.W.1.

Passmore, Gilhome & Co., Ltd. (210,364).—Private company. Registered December 14th. Capital, £300 in £1 shares. Objects:—To contract for and undertake the erection of buildings of all kinds, to manufacture or supply electrical and mechanical plant, to act as constructional, electrical and mechanical engineers, builders, and agents or representatives of any British, Colonial, or foreign electrical, constructional, or general engineers, &c. The permanent directors are:—R. P. Steyther, 17, Elmers End Road, Anerley, S.E.20, gentleman; A. G. Spence, 7, Thicket Road, Anerley, S.E.20, electrical engineer. Solicitors: Macdonald & Stacey, 2, Norfolk Street, Strand, W.C.2.

Radio Valves, Ltd. (210,351).—Private company. Registered December 14th. Capital, £500 in £1 shares. Objects:—To carry on the business of manufacturers of, and dealers in wireless apparatus, accessories and appliances, electrical engineers, &c. The subscribers (each with one share) are:—R. Roots, 19, Holmesdale Avenue, East Sheen, S.W.14, solicitor; E. G. Hake, Hotel St. Kilda, Torrington Square, W.C. The first directors are to be appointed by the subscribers. Qualification, 1 share. Remuneration as fixed by the company. Solicitor: R. Roots, 19, Holmesdale Avenue, East Sheen, S.W.14. Registered office: 3, Cross Lane, Eastcheap, E.C.3.

Official Returns of Electrical Companies.

Wholesale Electrical Company (1922), Ltd. — G. Farquhar, of 64, Victoria Street, S.W.1, ceased to act as receiver or manager on March 26th, 1925. (Notice filed December 11th.)

Frome Engineering Co., Ltd.—S. M. Pettitt, of 16, Albemarle Street, W.1, C.A., was appointed receiver and manager on December 8th, 1925, under powers contained in debentures dated July 28th, 1923, and September 10th, 1925.

Herbert Ward, Ltd.—Mortgage dated June 15th, 1925, to secure £1,164, and further advances, charged on 61-73 (odd numbers), Fernlea Road, Tooting. Holders: Halifax Permanent Benefit Building Society. (Registered December 9th, by permission of the Court.)

Burton & Tweedy, Ltd.—Satisfaction in full on December 9th, 1925, of debentures dated July 31st, 1923, securing £1,000.

W. S. Laycock, Ltd. (in liquidation).—Satisfaction on or before November 28th of mortgage or charge dated May 5th, 1925, securing the remuneration of the receiver and manager and payment of all debts, liabilities and obligations, if any, properly incurred or undertaken by him.

Rural Electricity Supply Co., Ltd. (107,281).—Capital, £10,000 in 9,500 preferred shares of £1 each and 10,000 deferred shares of 1s. each. Return dated November 14th, 1925. 5,512 preference and 5,713 deferred shares taken up. £3,269 9s. 3d. paid on 2,871 preference and 5,713 deferred shares (including £112 16s. 3d. paid on 205 forfeited shares). £2,641 considered as paid on 2,641 preference shares. Mortgages and charges, nil.

Simplex Conduits, Ltd. (88,290).—Capital, £100,000 in 50,000 ordinary shares of £1 each and 10,000 preference shares of £5 each. Return dated November 3rd, 1925. 40,000 ordinary and 10,000 preference shares taken up. £50,000 paid on the preference. £40,000 considered as paid on the ordinary. Mortgages and charges, nil.

Electric Car and Accessories Co., Ltd.—A. V. Chetland, of 16, Portobello Road, W.11, was appointed receiver on December 7th, 1925, under powers contained in debenture dated November 21st, 1920.

General Electric Co., Ltd.—Satisfaction to the extent of £42,900 on November 5th, 1925, of debenture stock dated July 22nd, 1921, securing £3,500,000.

Montevideo Telephone Co., Ltd. (27,208).—Capital, £220,000 in £1 shares. Return dated November 9th, 1925. 217,135 shares taken up. £217,135 considered as paid. Mortgages and charges, nil.

Vactite Wire Co. (1919), Ltd. (156,012).—Capital, £25,000 in £1 shares. Return dated December 3rd, 1925. 15,000 shares taken up. £3 paid. £14,997 considered as paid. Mortgages and charges, nil.

Price's Electrical Supplies, Ltd. (175,260).—Capital, £3,000 in £1 shares. Return dated October 16th, 1925. 1,210 shares taken up. £1,210 paid. Mortgages and charges, nil.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

Edison Swan Electric Co., Ltd.

The annual meeting was held on December 16th, Mr. C. F. Spencer (chairman) presiding. In presenting the report and accounts, which were reviewed in our issue of December 11th (p. 946), the chairman said that the authorised capital of the company was £432,565, of which £141,130 was in £1 shares. It was proposed to divide those shares into 4s. shares each, in order that all ordinary shares would be of one denomination. The articles of association also needed revision. There was outstanding on June 30th last £248,579 of first debenture stock and £55,034 of second debenture stock, whilst £200,000 of the latter stock was lodged with the company's bankers as security for a loan. During the current year the board would probably endeavour to consolidate the remaining first and second debenture stock and thus effect a reduction in loan charges. The debenture stock sinking fund showed a credit balance of £7,834, which would be appropriated to the redemption of debentures. Their bankers, the National Provincial Bank, Ltd., had been of great assistance to them during the three years in which they had been reorganising the company. The amount owing to the bankers was £110,000; when the present board took office a little over three years ago it was £314,150. They had reduced the long-term first and second debenture stock debt by £26,606. The reserve account was to be augmented to the extent of £50,000, making £130,000 in all. In pursuance of its aims, the board had in effect discharged debt to the extent of £230,756, which would be augmented shortly by further utilisation of sinking

funds; and it had created a reserve account of £130,000, which could not be considered entirely inadequate. The sum carried forward represented an increase of £11,701. In augmenting the reserve account and carry forward, they were endeavouring to consolidate the finances of the company. The reserve account was invested in the business, but the board would not be satisfied until it was invested in gilt-edged or other sound securities. The book value of patents, goodwill, &c., had been reduced by £26,606, and they hoped to pursue a consistent policy of reduction until it reached a figure of more reasonable dimensions. Their goodwill was sound. Their lamps were British made, and the quality was excellent. The glareless "Fullolite" lamp had become a favourite, and their radio sets and valves were well known. Regarding the trading position during the current year, the chairman said that their profits to November, 1925, were quite satisfactory, and they were getting a reasonable share of the trade available. What he had said indicated that the company was travelling along the road to prosperity, but he could not refrain from saying that there was a factor which might react unfavourably upon the company's fortunes, in common with those of others engaged in a similar class of business, with little chance at present of their being able to combat it. He referred to unrestricted and relentless foreign competition. Many of the products which they manufactured were subject to competition from abroad, against which they were almost powerless. Depreciated exchanges were in the nature of a bounty to the foreign producer; taxation in the countries of their foreign competitors was on a lower basis than national taxes and local rates in this country; we were paying the interest on our National Debt, which included the war debts due from foreign countries. German producers, owing to the policy of inflation, were almost compelled, in order to prevent their liquid resources and credit becoming valueless, to utilise them in the purchase of fixed assets, including plant and machinery of the latest type, and in this manner German producers had been able, at a small capital cost, to install the most modern methods of production, and were thus able to produce at very low prices; and the hours worked per week per operator in some foreign countries were greater than in this country, with a result that the weekly output was higher and the cost of labour in time per unit of product was less than ours, and lower wage rates were paid. Apart from those factors, the standing charges of the foreign manufacturer were much less per £100 of wages paid than those of the British manufacturer as general expenses abroad were on a much lower scale. There were many difficulties in trading with open doors and without retaliatory weapons. Turning to the brighter side, Mr. Spencer said that the Treaty of Locarno was bound to help in the restoration of confidence in Europe and confidence, after all, was the backbone of trade. The return to the gold standard and the subsequent raising of the ban on foreign issues of capital was also satisfactory, as part of our national products in pre-war days could only be sold abroad if the purchaser was lent the money to pay for them, and this was still a fact to-day. Thus there were signs of improvement, but he was apprehensive as to the nullifying effect of relentless foreign competition. The subject was one of increasing importance to the wage earner, who could not afford any more than the employer to have his livelihood so assailed, and he looked forward to the time when the worker and the employer would co-operate to prevent the entry of foreign goods, produced not on a commercial scale or basis, but on what one might term an ultra-subsidised production basis.

The report and accounts were adopted, and a resolution to grant the chairman a sum of £5,000 in recognition of his services was unanimously approved. At a subsequent extraordinary meeting resolutions were passed altering the articles of association and dividing the unissued ordinary shares, as mentioned by the chairman in his speech.

Cape Electric Tramways, Ltd.

Mr. L. Breitmeyer (chairman) presided at the annual meeting on December 16th, and in presenting the report and accounts (which were reviewed in our issue of December 11th, p. 946), he said that, although South Africa had suffered rom general business depression, and the company's earnings had been affected, in the last four months of the year a decided improvement had taken place, so that upon the whole very little variation had resulted. In Cape Town there had been a slight decrease in the number of passengers carried, and a consequent decline in the revenue. In Port Elizabeth, although the number of passengers had increased, there was a slight decrease in the receipts. The profit brought into the accounts from South Africa was £94,222, as against £95,454. The 6 per cent. debenture debt had been wholly redeemed, relieving the company of an annual charge of £25,778. It had been decided, however, to extend the term of repayment of the outstanding 5 per cent. debentures over a period of ten years. As stated in the report, neither the Port Elizabeth nor the Cape Town Municipalities had decided to expropriate the company's systems in their towns. About £100,000 would have to be expended upon track renewals and the purchase of additional plant and rolling stock during the next two years, but this expenditure would eventually prove remunerative. Cape Town was undoubtedly growing and wi normal trade conditions the company's business was likely to increase considerably. In Port Elizabeth the traffic had been maintained in spite of motor-'bus competition.

A final dividend of 4 per cent., free of tax, has been declared, payable on January 1st, 1926.

British Columbia Electric Railway Co., Ltd.

Brief mention of the report of this company for the year ended June 30th last was made in our last issue. Supplementing this we may say that the profit of £360,792, after paying debenture interest, &c., plus £60,471 brought forward, making £421,263, was distributed as follows:—Preference and preferred ordinary dividends, the latter totalling £6 6s. 9d. per cent., free of tax, and a total dividend of £8 per cent., free of tax, on the deferred ordinary, absorbing together £320,373; £40,000 was transferred to the general reserve in respect of expenditure on underground cables; and £60,890 is carried forward. During the year the sum of $4,503,908 was expended on additions to the power-generating plant and transmission systems, on new rolling stock, and in extensions of the lighting, power, and gas systems. The work of installing the fifth set at the Stave Falls power house has now been completed and with the installation of the new switching apparatus now nearing completion the plant will be one of the most modern and efficient in the country. The construction at Alouette Lake is progressing satisfactorily, the tunnel connecting Alouette Lake with Stave Lake having been completed in May 1925. On completion of the Alouette plant (13,400 h.p.), the total capacity of the company's stations will be 212,200 kW. The Bridge River Power Co., which owns water rights on Bridge River adjacent to the Pacific Great Eastern Railway and near the town of Lillooet, has been acquired. A favourable report on the property has been received but little will be done there before 1927. As the result of the establishment of new industries, house-building, and the increased use of electrical appliances, the energy sold during the year amounted to 322,656,645 kWh, as compared with 298,872,146 kWh in 1923-24. The number of consumers served rose from 80,793 to 84,587 and the motors connected from 96,815 h.p. to 99,990 h.p. A reduced rate based on the maximum demand principle has been instituted in Vancouver; this is expected to encourage the more liberal use of electricity. The contract with the Puget Sound Power & Light Co. expires next March, but although this will effect the company's revenue the general increase in business is expected to compensate for the loss. Street traffic continues to expand, the number of passengers carried having risen by 1,526,841 to 69,779,475. The amount of freight hauled rose from 355,384 tons to 371,634 tons, and there is a prospect of a further increase during the current year. Negotiations for the continuance of the present street railway fares came to a successful conclusion. The sales of gas and the number of consumers showed satisfactory increases. The properties of the company are stated to be in excellent condition. The annual meeting was to be held on Wednesday last (December 23rd).

Venezuela Telephone and Electrical Appliances Co., Ltd.

The annual meeting of this company (whose report was reviewed in our issue of December 4th, p. 909) was held on December 15th. Mr. J. S. Austin (chairman), who presided, said that there was reason for satisfaction at the result of the past year's working. Although they were paying the same dividend (8 per cent.), he felt that this was not large enough, but there was a reason for it. The company contemplated further capital expenditure and a further issue of capital. This expenditure for some time would be unremunerative, although dividends would have to be paid on the capital. The new section which was being added to the Caracas switchboard would be on the automatic system; this would be the first step in the conversion of the whole of Caracas to the automatic system. The new capital would be offered to the shareholders, and equal amounts of preference and ordinary shares would be offered at the same time, and the shareholders would be required to subscribe in equal amounts for the two classes, as there was such a very close connection between the two shares. The preference shares were entitled to a cumulative dividend of 8 per cent., and when that was paid the ordinary shares would receive 8 per cent., and after that the two shares would rank equally. The issue would probably be made either in June or December of next year. The report and the accounts were adopted, and at a subsequent extraordinary meeting the board was empowered to increase the capital to £280,000 by the issue of 70,000 each of £1 preference and ordinary shares. It was explained that the new capital would not all be issued at once; the first instalment would probably be £100,000.

The Vickers Reorganisation Scheme.

The proposals for reducing the ordinary capital, &c., outlined in our last issue, p. 989, came before an extraordinary general meeting at Sheffield on December 17th. Mr. Douglas Vickers, who presided, introduced the report of the company's advisers, and spoke at some length upon the circumstances which had led up to their appointment. He said that the losses were mainly due to the fact that after the war they had large armament factories upon their hands. Some of these had been successfully converted into producers of peace-time necessaries, but in some directions this policy had not been successful. In 1919 they had taken over the control of the British Westinghouse Co., in association with the Metropolitan Carriage, Wagon & Finance Co., hoping that the earnings of the electrical department would allow them to bridge over the period during which it was obvious that armament orders could only be small. Unfortunately for the company, the Washington Conference reduced programmes to a minimum, and restrictions of facilities for loans in this country led to orders being placed in France.

The electrical interests were doing reasonably well. The Metropolitan Carriage Co. and its subsidiaries had been, and were paying steady dividends, although not so large as they had anticipated. Mr. Vickers went on to deal with other branches of the group, and explained the resolutions. Mr. R. McKenna, one of the advisers, also addressed the meeting, and after some discussion, during which an amendment to defer consideration of the recommendations was proposed, the resolutions were adopted, the chairman agreeing that the shareholders should be represented on the Advisory Committee.

C. A. Vandervell & Co., Ltd.—The directors have issued a balance-sheet showing the results of the past two years' trading (to March 31st last). This shows a loss of £130,624 in 1923-24 (as compared with £18,111 in the preceding year) and a profit of £20,316 in 1924-25. It is considered that a drastic reorganisation is necessary. Since the date of the accounts, savings amounting to £118,768 have been effected by settlements in respect of outstanding loans. An offer has been made to the shareholders for the purchase of the whole of the preferred and deferred ordinary shares at the prices of 12s. 6d. and 2s. 6d. per share respectively. The directors advise the acceptance of the offer, stating that they are willing to dispose of their own holdings at these prices.

Marconi International Marine Communication Co., Ltd.—The directors state in a circular that it has been their practice to declare an interim dividend at about this period of the year. They do not feel, however, in view of the operators' strike, that they are justified in paying an interim dividend. As soon as the strike is ended they will reconsider the matter and, if possible, will pay an interim dividend of 2½ per cent. The circular says that British shipping has been passing through the most serious crisis in its history and the directors are confident that, before very long, the great majority of the wireless operators will realise that, in the interests of their industry, there is no alternative but for them to accept the reductions which are already in operation with every other class of seafarer.

Lima Light, Power and Tramways Co.—It is proposed to reorganise the capital of the company by the writing down of the ordinary shares from £P1,500,000 to £P750,000, and the issuing of new ordinary shares. The necessity for this action arises from the losses due to severe floods in the early part of the year. The preference shares and the 6 per cent. mortgage debentures issued in London a year or two ago are not affected by the scheme, being well secured.

Stock Exchange Notices.—The undermentioned have been ordered to be officially quoted:—

Brisbane Tramway Trust.—Stock and partly-paid scrip for £500,000 5½ per cent. Brisbane Tramway stock, 1944-1954.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Foundation Co.—10,000 8 per cent. participating preference shares of £1 each, fully paid, Nos. 129,503 to 139,502.

A. J. Stevens & Co. (1914), Ltd.—At an extraordinary general meeting held on December 15th, it was decided to increase the company's capital to £600,000 by the creation of 100,000 cumulative preference and 150,000 ordinary shares of £1 each.

French Company.—*Société l'Electro-Câble.*—The directors have declared a dividend of 8 per cent., and report that the great fluctuation during the year in the purchasing power of the franc had led buyers to restrict their orders to a marked extent.

Pinchin, Johnson & Co., Ltd.—A dividend at the rate of 6½ per cent. has been declared on the preference shares for the half-year ending December 31st.

Manila Electric Co.—A dividend of 50 cents per share has been declared on the common stock for the quarter ending December 31st.

Lisbon Electric Tramways, Ltd.—The dividend on the 6 per cent. cumulative preference shares has been declared for the year ending December 31st.

International Light and Power Co.—Dividend of 3 per cent., less British tax, on preference shares for six months to December 31st.

Shawinigan Water and Power Co.—A dividend of $2 per common share has been declared for the quarter ending December 31st.

Cawnpore Electric Supply Corporation, Ltd.—The dividend on the 7 per cent. preference shares for the current half-year is to be paid on December 31st.

Ferguson, Pailin, Ltd.—The directors have declared a final dividend of 9½ per cent. actual, making 13 per cent. for the year.

Canadian General Electric Co., Ltd.—A dividend of 1¾ per cent. on the preference shares for the quarter ending December 31st is announced.

Mackay Companies.—A quarterly dividend of 1¾ per cent. has been declared on the common stock.

Howard & Bullough, Ltd.—A quarterly dividend of 6d. per share is announced.

Bell Telephone Co. of Canada.—The usual quarterly dividend of 2 per cent. has been declared.

Stocks and Shares.

MONDAY MORNING.

STOCK Exchange markets enter with a bold and courageous air upon the Christmas week. Bargains are now being done for settlement on January 7th, 1926, and the knowledge that they need put up no money until the year has turned is a stimulus to purchasers Nor is any fear now entertained, as it was last week, of a possible rise in the Bank rate. Money conditions have become easier, and the outlook, viewed with apprehension so recently, is regarded with composure. New issues attract favourable attention, and the Stock Exchange has a clear conscience in wishing its clients a merry Christmas, with a prosperous New Year to follow.

The same traditional good wishes may be offered by anyone who writes upon the course of prices and developments in connection with electrical companies' stocks and shares. It is unhappily true that the year has been a bad period for holders of Home Railway securities. But in most of the other sections with which these weekly letters deal, the year now ending has seen a notable addition of strength to share values, and the price lists of to-day maintain the general trend of the past twelve months.

Kensington Electric Supply shares have risen to 13½. Metropolitans are a florin up, at 40s. 6d. St. James's and Pall Mall put on 2s. 6d., Westminsters 6d., and South Londons 1s. 3d. London Electric preference weakened to 5½, and County of London ordinary reacted to £3 after the vivid rise in the price last week. Richmond Electrics have advanced to 30s. Egham and Staines new ordinary are firmer at 22s. 6d. Midland Counties new ordinary are changing hands at 22s. 3d, and the 6 per cent. new preference mark 20s. 6d. New Lancashires are 2s. premium for the ordinary, and a slightly higher price is bid for the preference. Yorkshire Electric new ordinary are being dealt in on the basis of 20s. Electrical Distribution of Yorkshire stand at 35s., and the partly-paid new shares at 5s. 9d., a premium of 3s. 9d. Kensington 5 per cent. Second Preference were done the other day at 4¾ and 4 5/16ths. County of London new preference remain at about 22s. 6d. The rubber market excitement aroused a little demand for Anglo-Dutch Utilities 6 per cent. guaranteed debenture stock, now priced at 102.

Barcelona Tractions continue to be a fairly active market: the price is 31. Brazilian Tractions yielded a couple of their last week's rise of 7 points, the current price being 83. Anglo-Argentine Tramways first and second preferences are both ex dividend, allowing for which the prices show ¼ fall in each case. The outstanding feature in this department is a jump of 6¼, to 121¼, in British Columbia Electric Railway deferred stock. Some of the demand is reported to be for account of Canadian buyers. No alterations have taken place in British Electric Traction, or in the London traction issues.

The Marconi Marine Company has postponed payment of an interim dividend, owing to the recent strike of operators. The directors state, however, that they will consider the matter, and, if they feel justified in so doing, will pay an interim dividend of 2½ per cent., which would compare with 5 per cent. a year ago, the full dividend for the year being made up to 7½ per cent. The shares are a dull market at about 17s., and Marconis are 22s. 6d. sellers. Other wireless shares exhibit a tendency to droop.

Equipment shares keep steady. Cromptons are the best spot, with a rise to 16s. 3d. The company is said to be doing well, and to be well supplied with orders. English Electrics weakened to 18s. 6d. Johnson & Phillips have been well maintained, and the market is very firm as a whole. The engineering list, with iron and steel shares, is stronger, by reason of the speeches made at last week's meetings of the Vickers and the Dorman Long companies. Evidence of substantial savings upon this year's coal bills by the railway companies was given before the Coal Commission by Sir Ralph Wedgwood, and led to advances in Home Railway stocks. On balance, no net change has occurred in the Undergrounds, but the prices had been flat before Sir Ralph Wedgwood's statement, and the falls have been recovered. Metropolitans, for instance, had been down to nearly 68 before they rallied to 69.

Great Northern Telegraphs are £1 lower at 33. Western Telegraphs and Globe ordinary have risen 5s. apiece. Automatic Telephones are unchanged at 51s. 3d. United River Plates continue their advance, being now up to 7¼. The industrial list remains rather overshadowed by the activity of the rubber market, in which latter a shake out, due to an abrupt drop in the price of the product, was followed by sharp improvement in sympathy with a rise in raw rubber. Share prices are again on the mend, and the interest of the public in the popular market of the moment is as keen as ever.

Share List of Electrical Companies.

	Nom. £	Dividend. 1923.	1924.	Price Dec. 21. 1925.	Rise or fall.	Yield. p.c.
Home Electricity Companies.						
Bournemouth and Poole	1	13	14	50/6	—	4 14 1
Brompton Ordinary	1	10	10	1⅝	—	*6 3 1
Charing Cross Ordinary	1	14½	15	2⅞	—	6 3 1
do. do. 4½ Pref.	1	4	4½	17/6	—	5 2 10
Chelsea	1	12	12	2¼	—	5 13 0
City of London	1	15	15	50/9	—	5 18 1
do. do. 6% Pref.	1	6	6	22/-	—	5 4 4
Clyde Valley	1	8	8	29/6	—	5 8 6
County of London	1	15	15	60/-	—9d.	5 0 0
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	24/-	—	5 16 8
do. 7% Pref.	1	6	7	21/6	—	6 10 8
Elec. Supply Corporation	1	10	10	92/6	—	6 8 0
Kensington Ordinary	5	14	15	13½	+½	5 13 2
Lancs. Light and Power	1	7½	7½	26/-	—	5 15 5
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.	5	6	6	5½	—¼	5 9 1
Metropolitan	1	10	11	40/6	+1/-	5 8 7
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	22/6	—	6 4 5
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	24/6	—	5 14 3
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	5	17½	17½	15⅝	+⅛	5 13 8
South London	1	15	15	2⅝	+1/16	5 18 1
South Metropolitan Pref.	1	7	7	1⅜	—	5 12 8
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	18/9	—	6 8 1
Westminster Ordinary	1	15	15	46/-	+6d.	6 10 5
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	30/6	—	5 5 0
Home Rails.						
Central London Ord. Assented	Stock	4	4	67	—	5 19 5
Metropolitan	,,	4	5	69	—	7 5 0
do. District	,,	8½	8½	47	—	7 9 4
Underground Electric Ordinary	10	Nil	Nil	2½	—	Nil
do. do. "A"	1/-	Nil	Nil	7/-	—	Nil
do. do. Income Bonds	6	6	6	98	—	*6 2 5
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	103	—	5 16 6
do. Def.	,,	1½	1½	24⅞	—	6 0 8
Automatic Telephone	1	8	6	51/3	—	2 6 10
Chili Telephone	5	6	5	6-7/16	—	*4 7 0
Cuba Sub. Ord.	10	5	5	6⅝	—	7 8 2
Eastern Extension	10	10	10	18	—	*5 9 7
Eastern Tel. Ord.	Stock	10	10	177½	—	*5 12 6
Globe Tel. and T. Ord.	10	10	10	18⅝	+½	*5 6 8
do. do. Pref.	10	8	8	11	—	5 8 4
Great Northern Tel.	10	22	22	33	—1	6 13 4
Indo-European	25	7	8½	45½	—	*4 13 5
Marconi		10	10	1¼	—	9 17 10
Marconi Marine	1	10	7½	8	—	8 11 6
Oriental Telephone Ord.	1	12	12	42/6	—	*5 12 11
United R. Plate Tel.	5	8	8	7⅞	+1/16	5 3 3
Western Telegraph	10	10	10	18xd	+½	*5 11 1
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3¾xd	—¼	8 9 2
do. do. 2nd Pref.	5	6	6	3-1/16xd	—¼	9 8 2
do. do. 5% Deb.	Stock	5	5	73½	—	6 16 3
British Electric Traction Ord.	,,	6	6	120	—	5 0 0
do. do. 6% Pref.	,,	6	6	105	—	5 14 3
Brazil Traction	100	4	4	83	—2	4 16 5
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	85½	—	5 17 0
do. do. Preferred	,,	9d/-	9d/-	101½	+5	*4 14 5
do. do. Deferred	,,	12s/6	12s/6	121½	+6	*5 6 7
do. do. Deb.	,,	4½	4½	76	—	5 11 10
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/-	—	Nil
London United Tram. Deb.	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	62½	—	8 0 0
Mexican Light Common	100	Nil	Nil	31½	—	Nil
do. Pref.	100	Nil	Nil	61½	—	Nil
do. 1st Bonds	—	5	5	72	—	6 18 11
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8
Manufacturing Companies.						
Babcock & Wilcox	1	12	12	51/3	—	*4 13 4
British Aluminium Ord.	1	5	10	38/-	—	5 5 3
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	2¼xr	—	5 9 1
Brush Ord.	1	10	10	26/3	—	7 12 4
Callenders	1	15	15	3½	—	4 12 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	16/3	+1/16	... ...
Edison-Swan	4/-	10	10	9/-	—	4 9 0
do. 5% Deb.	Stock	5	5	84	—	5 19 1
Electric Construction	1	10	10	30/6	—	6 3 0
Enfield Cable, Pref.	1	7½	7½	1⅜	—	6 0 0
English Electric	1	5	5	18/6	—9d.	5 8 0
do. do. Pref.	1	6	6	21/-	—	5 14 3
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	5	7½	27/6	—	5 9 1
Henley	1	15	16	3½	—	4 11 5
do. 4½% Pref.	5	4½	4½	4⅝	—	5 6 0
India-Rubber	1	5	5	1-1/16	—	*4 14 1
Johnson & Phillips	1	10	10	54/6	—	3 13 7
Met-Vickers, Ord.	1	8	8	27/6	—	5 16 5
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	29/-	—	4 13 9
Telegraph Construction	12	20	20	27	—	4 9 0

*Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price December 21st.	Fortnight's Inc. or dec.
a Acid, Oxalic per lb.	5¾d.	...
a Ammoniac, Sal per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£62	...
a Bisulphide of Carbon ,,	...	...
a Borax ,,	£25	...
a Copper Sulphate ,,	£35 10s.	...
a Potash, Chlorate per lb.	4d. to 4½d.	...
a ,, Perchlorate ,,	5½d.	...
a Shellac per cwt.	£15 15s.	...
a Sulphur, Commercial ,,	£8 10s.	...
a ,, Roll ,,	£8 10s.	...
a Soda, Chlorate per lb.	3½d. to 3¾d.	...
a ,, Crystals per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots per ton	£120 to £125	...
b ,, Wire ,, per lb.	1/9 to 2/6*	...
b ,, Sheet ,, ,,	1/8 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		...
Grade I per ton net	£952	£4 dec.
Grade II ,, ,,	£179	£3 dec.
Grade III ,, ,,	£99	£1 dec.
c Brass (rolled metal 2" to 12" basis) per lb.	9½d.	...
c ,, Tubes (solid drawn) ,,	1/- to 1/0½	...
c ,, Wire, basis ,,	10½d.	...
c Copper Tubes (solid drawn) ,,	1/1	...
c ,, Bars (best selected) per ton	£90	£2 dec.
c ,, Sheet ,,	£90	£2 dec.
c ,, Rod ,,	£90	£2 dec.
d ,, (Electrolytic) Bars ,,	£96 5s.	...
d ,, ,, Sheets ,,	£148 10s.	...
d ,, ,, Wire Rods ,,	£76 5s.	...
d ,, ,, H.C. Wire per lb.	9-7/16d.	...
f Ebonite Rod ,, ,,	2/8 to 2/9	...
f ,, Sheet ,, ,,	2/8 to 2/8	...
a German Silver Wire ,,	2/2	1d. dec.
b Gutta-percha, fine ,,	6/6	...
b India-rubber, Para fine ,,	4/-	6d. dec.
f Iron Pig (Cleveland Warrants) per ton.	nom.	...
f ,, Wire, galv. No. 8, P.O. qual. ,,	£12	...
g Lead, English Pig ,,	£36	...
g Mercury per bot.	£15 to £15 10s.	...
e Mica (in original cases) small per lb.	8d. to 8/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/8½	...
p ,, ,, drawn bars & rods ,,	1/8	...
p ,, ,, rolled strip & sheet ,,	1/9½	...
p ,, ,, wire ,,	1/8½	...
e Platinum per oz.	£26	...
d Silicium Bronze Wire per lb.	1/0½	...
r Steel, Magnet, in bars ,,	7½d.	...
a Tin, Block (English) per ton.	£285 to £286	£3 dec.
a ,, Wire, Nos. 1 to 16 per lb	4/8	2d. dec.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
j Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

The Coal Commission.—Railway Electrification.—"I do not think, looking over the next ten years, that the Commission need seriously consider the question of main-line electrification," said Sir Ralph Wedgwood, chief general manager of the L. and N.E. Railway, and chairman of the General Managers' Conference, 1925, when giving evidence before the Coal Commission. Sir Ralph's remark was made *apropos* the railway's consumption of coal. He added, says the *Daily Mail*: "If the cost of power were reduced and the progress of invention in some way cheapened the price of generating electricity or of the plant required for the electrification of lines, then you might see some change." Sir Ralph said that, compared with the average pit-head prices paid in 1911, coal cost the four grouped companies approximately £9,250,000 more in 1924.

"The Times'" Time.—A new bracket clock has been erected on the Queen Victoria Street frontage of *The Times* building; it is a handsome reproduction in bronze, copper, and opal of the paper's well-known emblem, the open book, flanked by the closed volumes *Times Past, Times Future*. The clock, according to the *Horological Journal*, is operated on the Synchronome system; the hands are driven by an electromagnet applied to the motion work behind the centre of each dial, the simple movement being so small as to be concealed by the central bosses. The entire space between the dials is available for illumination, and by the device known as "detachable centres" the central opal panels which carry the movements and hands can be readily drawn inwards, thereby providing access to all parts of the clock. One can open the window and step on a platform between the brackets, open the door in the case, and walk into the space between the dials, when lamp changes and cleaning, inside and out, can be carried on in comfort. The work has been carried out by the Synchronome Company, Limited, under the supervision of Mr. F. Hope-Jones.

Exports and Imports of Electrical Goods and Machinery in November, 1925.

IT will be seen from our table of last month's exports that there was a further decline, though not so large as that which occurred in October. Two items were mainly responsible for the decrease, *viz.*, "Other motors and generators" and submarine telegraph and telephone cable—the latter being the most variable of the items which make up the list. There were only six increases, and none of these was of great consequence, unless we except the rise of £11,005 in the value of exported glow lamps. As compared with November, 1924, the position is even less favourable. Five items show serious falls—railway and tramway motors, other motors and generators, the two telegraph and telephone cable sections, and telegraph and telephone instruments and apparatus—and these are only partly balanced by fairly substantial increases in insulated wires and cables, and glow lamps. Thus the excess of this year's over last year's imports has been further reduced, although it is now certain that the complete figure for 1925 will be higher than the 1924 total.

The imports also showed a decline as compared with October, although this amounted only to about 2 per cent., as against about 7 per cent. in the case of exports. The decrease was due to a large fall (£21,454) in imports of insulated wires and cables, which was partly offset by a rise of £12,992 in the case of unenumerated electrical machinery. In comparison with November, 1924, imports showed a rise of £46,904, the effects of a decline of £40,993 in telegraph and telephone instruments being nullified by large increases in unenumerated electrical goods and apparatus (£20,371), and batteries and accumulators (£44,118). There was only one decrease apart from that already mentioned.

The re-export section exhibits a series of decreases as compared with the previous month's figures, there being only two rises recorded. On the other hand, comparison with November, 1924, reveals principally increases.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Nov., 1925.	Inc. or dec. as compared with Oct., 1925.	Inc. or dec. as compared with Nov., 1924.	Electrical imports for Nov., 1925.	Inc. or dec. as compared with Oct., 1925.	Inc. or dec. as compared with Nov., 1924.	Electrical re-exports for Nov., 1925.	Inc. or dec. as compared with Oct., 1925.	Inc. or dec. as compared with Nov., 1924.
Electrical goods and apparatus (unenumerated)	£160,199	+ £1,404	− £7,118	£119,177	+ £2,190	+ £20,371	£6 718	− £1 912	+ £1,346
Insulated wires and cables ...	247 661	− 3,684	+ 45 835	47 792	− 21,454	− 2,179	573	− 231	+ 571
Glow lamps	61,552	+ 11,005	+ 21,353	33 2 0	− 471	+ 3 051	87	− 433	− 347
Arc lamps and parts	1,163	+ 59	+ 184	2,037	− 1,537	+ 406	5	− 20	− 37
Batteries and accumulators ...	78 481	+ 4.374	+ 6.6 8	101 314	+ 5 125	+ 44,118	509	− 1.438	+ 230
Meters and instruments ...	33,818	− 1,444	− 9,498	18,3 2	− 5,663	+ 5,114	567	− 20	− 19
Carbons	429	− 216	− 2,439	13,728	+ 2,882	+ 4,877	119	− 19	+ 71
Electrical Machinery—									
Electrical machinery (unenumerated)	223.205	− 4 217	+ 7,623	78,600	+ 12.992	+ 6.904	7,762	+ 988	− 680
Railway and tramway motors	43 878	+ 4,469	− 61 545	—	—	—	—	—	—
Other motors and generators ...	128.251	− 58,560	− 41,095	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	6 062	− 2,432	+ 810	376	+ 23	+ 346	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	53.975	+ 3,404	− 29,510	17.958	+ 4,005	+ 4,889	1,550	+ 1,550	+ 482
Submarine telegraph and telephone cable	442	− 12,651	− 21,540	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	225.083	− 3 824	− 56,680	71,744	− 9,386	− 40.993	3,440	− 179	+ 1,212
Totals	£1 264,199	− £99,283	− £147,002	£504.248	− £11,294	+ £46.904	£21,330	− £1,714	+ £7,829
Increases for eleven months ended November, 1925		Exports. + £1,918.718			Imports. + £975.817			Re-exports. + £38.334	

Electricity Supply Development.

SIR HARRY RENWICK, K.B.E., presided at the annual meeting of the Provincial Electric Supply Association of the United Kingdom on December 17th, and in reviewing the work of the past year said that considerable progress had been made in the re-organisation of electricity supply. The Association had taken an active part in the framing of legislation affecting the industry. He considered that there was an urgent need for a revision of the regulations governing the use of overhead lines, as only by this means would it be possible to supply cheap electricity in rural areas. The progress made since 1920 was very encouraging, the combined output of all generating stations in the United Kingdom having increased by 43 per cent. in four years. There was no doubt that future progress would be more rapid as new fields of development were being opened up, and there was a tendency to remove many restrictions which had hitherto hampered the industry. He regretted the long delay in the publication of the Weir Committee's report; this was holding up a number of schemes of development, but it was to be hoped that when the report was issued it would be found that it was of a helpful nature. With wider legislative and financial facilities to assist in opening up and developing new fields of supply, and the prospect of increased efficiency of generation, he considered that a still brighter and more prosperous future lay ahead for the industry. Sir Harry Renwick made reference to an article which had appeared that week in the daily Press, which, he said, created false and erroneous impressions. Electricity supply was a highly technical matter, and amateur critics who compared conditions here with those in America were liable to make many mistakes. It had been disproved that pit-head generating stations could possibly solve the problem of cheap electricity; there were many other things besides coal supplies which had to be taken into consideration. Many capital stations in this country operated at a much higher efficiency than similar undertakings in America, and we had even supplied some of America's most efficient plant. The rates for power in Great Britain compared very favourably with those prevailing in America; in many cases, indeed, they were even lower. In conclusion, the chairman paid a tribute to the work of the Electricity Commissioners, and said that the problem of electricity supply was fully understood by both engineers and industrial leaders in Great Britain.

The Electrical Exports of Sweden.

The Figures for 1923 and 1924 Compared.

The following figures showing the exports from Sweden of electrical goods, machinery, and apparatus in 1924 are extracted from the recently-issued official trade statistics. The figures for 1923 have been added, together with notes of increases and decreases:—

	1923. Kr.	1924. Kr.	Inc. or dec. Kr.
Accumulators and parts thereof—			
Unmounted cells:			
Total	183,000	91,000	− 92,000
To Netherlands	3,000	*	—
,, Great Britain	146,000	44,000	− 102,000
,, United States	1,000	*	—
Accumulator plates:			
Total	282,000	115,000	− 167,000
To Denmark	60,000	12,000	− 48,000
,, Netherlands	214,000	99,000	− 115,000
Cells and batteries:			
Total	571,000	1,030,000	+ 459,000
To Netherlands	22,000	19,000	− 3,000
,, Great Britain	367,000	386,000	+ 19,000
,, Japan	*	202,000	*
Switchboards, fitted—			
Total	407,000	286,000	− 121,000
To Denmark	48,000	24,000	− 24,000
,, Spain	40,000	14,000	− 26,000
,, British East Indies	130,000	50,000	− 80,000
Wireless telegraph and telephone apparatus—			
Total	450,000	692,000	+ 242,000
To Norway	45,000	43,000	− 2,000
,, Latvia	65,000	—	− 65,000
,, Spain	26,000	67,000	+ 41,000
,, Switzerland	173,000	233,000	+ 60,000
Panels for telephone switchboards—			
Total	144,000	63,000	− 81,000
To Denmark	10,000	14,000	+ 4,000
,, British South Africa	17,000	*	*
,, China	21,000	*	*
Generators and motors, each weighing not more than 50 kg.—			
Total	4,437,000	8,570,000	+4,133,000
To Denmark	342,000	498,000	+ 156,000
,, Netherlands	609,000	1,802,000	+1,193,000
,, Belgium	759,000	803,000	+ 44,000
,, Great Britain	706,000	2,064,000	+1,358,000
,, France	797,000	1,079,000	+ 282,000
Generators and motors weighing from 50 to 100 kg.—			
Total	339,000	394,000	+ 55,000
To Norway	41,000	25,000	− 16,000
,, Finland	39,000	29,000	− 10,000
,, Great Britain	66,000	33,000	− 33,000
,, Australia	57,000	28,000	− 29,000
Generators and motors weighing from 100 to 500 kg.—			
Total	1,835,000	1,774,000	− 61,000
To Norway	123,000	122,000	− 1,000
,, Finland	247,000	225,000	− 22,000
,, Great Britain	490,000	186,000	− 304,000
,, Spain	168,000	228,000	+ 60,000
,, Australia	267,000	140,000	− 127,000
Generators and motors weighing from 500 to 3,000 kg.—			
Total	1,769,000	1,320,000	− 449,000
To Finland	204,000	118,000	− 86,000
,, Belgium	135,000	184,000	+ 49,000
,, Great Britain	242,000	145,000	− 97,000
,, Spain	292,000	150,000	− 142,000
,, British East Indies	122,000	44,000	− 78,000
Generators and motors weighing more than 3,000 kg.—			
Total	1,700,000	3,000,000	+1,300,000
To Norway	250,000	25,000	− 225,000
,, Denmark	202,000	100,000	− 102,000
,, Finland	264,000	140,000	− 124,000
,, Great Britain	125,000	127,000	+ 2,000
,, Spain	242,000	176,000	− 66,000
Transformers weighing from 100 to 500 kg.—			
Total	507,000	460,000	− 47,000
To Finland	92,000	41,000	− 51,000
,, Belgium	76,000	97,000	+ 21,000
,, Spain	140,000	62,000	− 78,000
,, Australia	58,000	16,000	− 42,000
Transformers weighing from 500 to 3,000 kg.—			
Total	620,000	421,000	− 199,000
To Finland	102,000	52,000	− 50,000
,, Belgium	78,000	92,000	+ 14,000
,, Spain	140,000	47,000	− 93,000
Transformers weighing more than 3,000 kg.—			
Total	1,308,000	1,505,000	+ 197,000
To Finland	80,000	100,000	+ 20,000
,, Belgium	572,000	165,000	− 407,000
,, Great Britain	81,000	558,000	+ 477,000
,, France	140,000	*	*
,, Spain	135,000	84,000	− 51,000
,, Australia	172,000	*	*
Incandescent lamps: Metal filament—			
Total	181,000	73,000	− 108,000
To Norway	24,000	2,000	− 22,000
,, Denmark	11,000	3,000	− 8,000
,, Finland	90,000	52,000	− 38,000
,, Australia	20,000	6,000	− 14,000
Starting, regulating and reduction resistances, &c.—			
Total	531,000	520,000	− 11,000
To Finland	126,000	83,000	− 43,000
,, Spain	70,000	68,000	− 2,000
,, Australia	68,000	23,000	− 45,000
Stators, rotors, current collectors, magnet coils, &c., weighing each not more than 50 kg.—			
Total	73,000	94,000	+ 21,000
To Norway	19,000	16,000	− 3,000
,, Denmark	9,000	3,000	− 6,000
,, Finland	11,000	11,000	—
Oil break switches, hand-operated—			
Total	163,000	113,000	− 50,000
To Denmark	26,000	*	—
,, Finland	50,000	19,000	− 31,000
,, Spain	38,000	23,000	− 15,000
Switches, not specified—			
Total	101,000	189,000	+ 88,000
To Norway	26,000	9,000	− 17,000
,, Finland	28,000	35,000	+ 7,000
,, Spain	12,000	14,000	+ 2,000
Safety appliances, not specified—			
Total	676,000	289,000	− 387,000
To Netherlands	254,000	28,000	− 226,000
,, British South Africa	75,000	20,000	− 55,000
,, Finland	28,000	35,000	+ 7,000
,, Spain	69,000	24,000	− 45,000
,, Australia	34,000	49,000	+ 15,000
,, China	26,000	9,000	− 17,000
,, British East Indies	17,000	2,000	− 15,000
Telephone apparatus, weighing less than 5 kg. per article—			
Total	1,202,000	796,000	− 406,000
To Netherlands	160,000	96,000	− 64,000
,, Norway	121,000	8,000	− 113,000
,, Mexico	135,000	95,000	− 40,000
,, Spain	111,000	60,000	− 51,000
,, China	79,000	31,000	− 48,000
,, Finland	103,000	90,000	− 13,000
,, Poland	330,000	123,000	− 207,000
Ditto, weighing 5 kg. or more—			
Total	971,000	1,011,000	+ 40,000
To Finland	136,000	123,000	− 13,000
,, Poland	66,000	98,000	+ 32,000
,, Portugal	66,000	*	*
,, British South Africa	84,000	174,000	+ 90,000
,, China	223,000	214,000	− 9,000
,, Australia	100,000	28,000	− 72,000
Telegraph apparatus, telephone switches and switchboards and parts—			
Total	5,970,000	5,736,000	− 234,000
To Norway	225,000	36,000	− 189,000
,, Finland	318,000	308,000	− 10,000
,, Russia	514,000	20,000	− 494,000
,, Poland	498,000	211,000	− 287,000
,, Netherlands	2,235,000	2,626,000	+ 391,000
,, British South Africa	372,000	312,000	− 60,000
,, Mexico	591,000	647,000	+ 56,000
,, Australia	158,000	195,000	+ 37,000
,, China	132,000	166,000	+ 34,000
Cables and cords with sheath of lead or other metal; maximum diameter 25 mm.—			
Total	583,000	425,000	− 158,000
To Poland	160,000	107,000	− 53,000
,, Germany	3,000	*	*
,, Netherlands	208,000	89,000	− 119,000
Ditto, of greater diameter—			
Total	268,000	121,000	− 147,000
To Poland	179,000	*	*
,, Australia	29,000	*	*
,, Mexico	—	66,000	+ 66,000

	1923. Kr.	1924. Kr.	Inc. or dec. Kr.
Wires and cables insulated by paper, asbestos or varnish; maximum thickness of wire 0.5 mm.—			
Total	596,000	470,000	– 126,000
To Denmark	74,000	79,000	+ 5,000
„ Great Britain	240,000	251,000	+ 11,000
Ditto, thickness of wire greater than 0.5 mm.—			
Total	333,000	106,000	– 227,000
To Netherlands	134,000	13,000	– 121,000

* Not separately distinguished.
[£1 = about 17 kronor.]

Reviews.

Time Standardisation of Workshop Operations. By T. PILKINGTON, M.I.Mech.E. 8½ in. by 5½ in. by ¾ in. Pp. x + 253; fully illustrated. London: Sir Isaac Pitman and Sons, Ltd. Price, 16s. net.

It has long been recognised that the system of wages still so extensively employed in the majority of industrial establishments, based merely upon the number of hours which a man spends in the works is unsatisfactory both from the point of view of the workman himself and that of his employer. To the former it means that he reaps no reward for either ability or hard work, while to the latter it involves the payment of wages often far in excess of those actually earned, with the result that manufacturing costs are too high and contracts are lost. Many systems have been proposed whereby these obvious evils can be eliminated, such as the piecework system and the premium bonus system, but all of these must fail unless an exact estimate is made of the actual work involved on any particular job and an accurate idea is formed of the time which a workman or a gang of average ability should take to perform it. It is on this question of "time setting" that many piecework systems break, since nothing is more unsatisfactory to the men than to feel that they are being called upon to do more than was originally intended or to do it in a shorter time, and from the works manager's point of view it is equally unsatisfactory to find that a job can be performed in considerably less than the estimated time. Thus, the whole problem of a rational system of wages, including the exact determination of the productive capacity of the workers and of the manufacturing plant, may be said to be based upon the correct determination of the time standards for the various operations and this in its turn involves the training of the *personnel* of the time setting department to determine such time standards with an exact knowledge of the amount of work involved on each job, the capacities of the various machines to which it will pass and the average capabilities of the men who will carry out the work. It must be at once admitted that the task of training the time setters to the efficient performance of their tasks is no easy one in view of the varied nature of the work involved.

In the book under review, an attempt has been made to lay down the scientific basis of the determination of time standards. It is based upon the author's experience of this kind of work both in the United States and in this country, and it is of interest to note that he has been engaged chiefly in electrical work, so that the examples chosen represent up-to-date practice in electrical shops. His aim, however, has been rather to state the principles underlying the fixing of time standards and to describe the methods whereby such standards are fixed so that, although the examples chosen refer particularly to electrical practice, they can be applied with confidence to any operations in other industries. The book is divided into twelve chapters, the first two of which may be regarded as introductory, dealing as they do with the general problems of time standardisation, its aim and objects, and so on. In the third chapter the problem of fixing the time standards is studied in detail, the question of the various forms and charts required is dealt with and the relationship of the system to the workmen is discussed. This point is of great importance since the sympathetic co-operation of the workers is essential to success. Thus we heartily endorse the suggestion of the author that in addition to instructing the workers in efficient methods, attention should always be paid to any suggestion or complaints. In the next four chapters the question of formulæ, instruction cards, fixing of speeds and feeds of machines and the general routine of the time standards department is discussed, including the final problem of fixing the bonus charts for the individual workmen, for the gang, or even for the department. The question of setting the limits of time for any particular job is dealt with and it is of interest to note as indicating that the principle of time standardisation does not necessarily tend to reduce the man almost to the level of the machine he operates as is so frequently urged against the system, that the ethics of the problem is referred to, the question of charging time rates is discussed and the means whereby both the exceptional and the incompetent workman may be dealt with to the complete satisfaction of both is dealt with. In the remainder of the volume, the author discusses such problems as cutting-tool data, grinding practice, assembling, &c., giving many useful tables and other valuable information in so doing. This part of the work may be necessary as indicating the method of fixing the time for various operations, but at best it can only give a comparative idea since the equipment and facilities of different shops may vary between wide limits. Finally, we have a long chapter on incentives which we suggest might well have been placed before the chapters on cutting-tool data, &c. After all, the justification of time standardisation may be said to be based upon the idea that if the incentive is strong enough, human nature is such that the men will be eager to put forth the greater effort required. Thus production is increased, costs are lowered, and the greatest drawback of our present wage system, its failure to yield any incentive or to reward merit, is eliminated. And once the time standard has been adequately determined, then the question of incentive must at once be faced. Nevertheless, the author is to be congratulated upon having put into the pages of a single book the accumulation of knowledge of this important subject which hitherto has only been more or less scantily dealt with from time to time in the commercial and technical Press. It is, we believe, the first book published in this country which deals with the time analysis of manufacturing operations in a scientific manner, and it should be studied by all works managers, estimators and production engineers who are anxious to increase the productivity of their works and at the same time to raise the status of the men whom they employ.

The Mechanical Design of Overhead Electrical Transmission Lines. By E. T. PAINTON, B.Sc. Hons. (Lond.), A.M.I.E.E. Pp. viii + 274; figs. 189. London: Chapman & Hall, Ltd. Price 21s. net.

This book is a companion volume to "The Electrical Design of Overhead Power Transmission Lines," by Messrs. William T. Taylor and R. E. Neale, and the two together form a complete treatment of the design of this class of apparatus.

The book opens with a discussion of the various materials employed both for plain and composite conductors, the first chapter being devoted to tensile strengths, moduli of elasticity, distribution of stress in composite conductors, and other similar problems in strengths of materials.

The two following chapters deal with problems in connection with sag and stress, and with the design of supports. The mathematical treatment of sag problems is somewhat complicated and the author has done well to include alternative graphical methods. In the case of the chapters on supports the mathematical treatment is somewhat less involved. This is perhaps justifiable as, in the case of steel supports, such treatment would be more applicable to a treatise on "Theory of Structures." It is, however, a pity that the author has not gone a little more fully into the choice of steel supports, although such a question is essentially of a controversial nature.

Chapters V and VI deal respectively with wood and steel supports. In passing, it is a little difficult to understand why these chapters have been separated from Chapter III, also on supports, by a chapter on insulators. These two chapters deal very effectively with the design of supports and the calculation of stresses. The question of foundations is also fully discussed.

Chapter IV deals with insulators, and gives a brief *résumé* of the various types employed. Methods of manufacture are described, together with the tests to which insulators should be subjected.

The two remaining chapters deal respectively with constructional details and erection. The former chapter gives various methods of attaching conductors to insulators, forming joints, guarding, and protecting against transient disturbances due to lightning, while the latter deals with the many practical problems involved in the erection of a line.

The book is excellently produced and well illustrated, and although dealing with a highly specialised subject, contains much that is of general interest.

To those directly interested in overhead line construction it should be of great service, and in conjunction with the companion volume it is a valuable addition to any technical library.

Wireless Questions and Answers. By P. J. RISDON, F.R.S.A. Pp. 92; figs. 40. London: W. Foulsham & Co., Ltd. Price 1s. net.

This little book consists of 288 questions with answers in wireless telegraphy and telephony, referring almost entirely to simple receiving circuits and the elementary theory of electricity.

It is especially suited to the needs of the amateur who so often gets rather "fogged" by trying to assimilate a great mass of new facts set forth in text-books and periodicals. In such cases a handy book of clear-cut simple questions and answers is most useful in directing attention to the main points which it is essential to understand, and Mr. Risdon has been successful in putting together just what is required.

An unusual, and commendable, feature of the book is the inclusion of a number of incorrect diagrams with explanations of why they are wrong, a scheme which should certainly help the beginner who is apt to accept even simple circuits without fully understanding the use of the various devices shown.

The answers given throughout are concise and clear, and with the possible exception of numbers 112, 215, 219, and 224, are sufficiently accurate for the needs of the beginner. No. 199, too, omits to state the units employed; but this rather meticulous criticism is hardly apposite in dealing with an elementary book, which, as we have indicated, fulfils well the purpose for which it was written.

A satisfactory index is included.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

A "Fuse-Blown" Indicator.

With a view to saving time in locating "blown" fuses in large installations, the BRIGHTON LIGHTING & ELECTRICAL ENGINEERING CO., LTD., is placing on the market a switch-fuse combination, the "Telltale," fig. 1, in which is incorporated an indicating device for denoting when the fuse has blown.

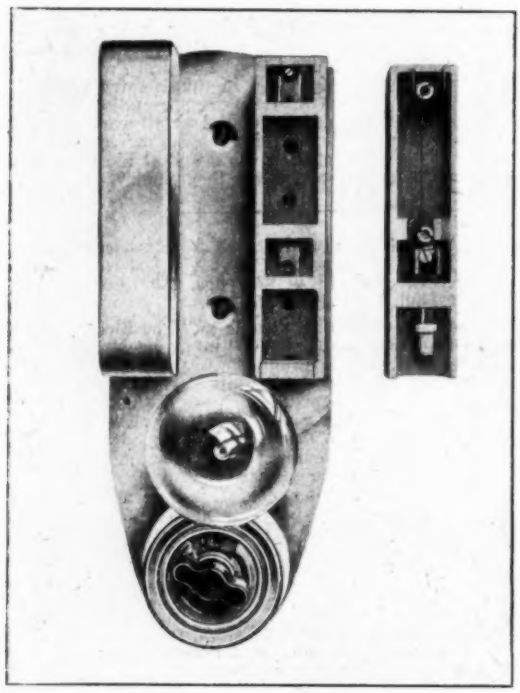


Fig. 1.—Switch-Fuse Unit with Indicator.

This consists of a small switch which is held open when the fuse is intact, and a small lamp. The latter is put in circuit when the fuse is broken by the small switch, which falls on to contacts and closes the lamp circuit. The unit can be supplied with any number of ways and is provided with 10 spare fuses.

A Novel Generating Set.

The accompanying illustration, fig. 2, is of a 42-kW generating set recently supplied by MESSRS. J. W. BROOKE & CO., LTD., Adrian Works, Lowestoft, for shipment abroad. It is of particular interest in that the engine is an example of the marine type of motors which are being built by this firm and adopted for industrial purposes. The motor is a "Brooke" 65-h.p., six-cylinder, heavy-duty unit, having a bore of 5½ in. and a stroke of 6 in., the pistons, connecting rods, bearings, valve guides and many other accessory parts being renewable and interchangeable. All parts are claimed to be accurately constructed of the best material, the cylinders and pistons being of hard, close-grained cast-iron, the camshaft of low-carbon steel and the crankshaft and valves of nickel-steel.

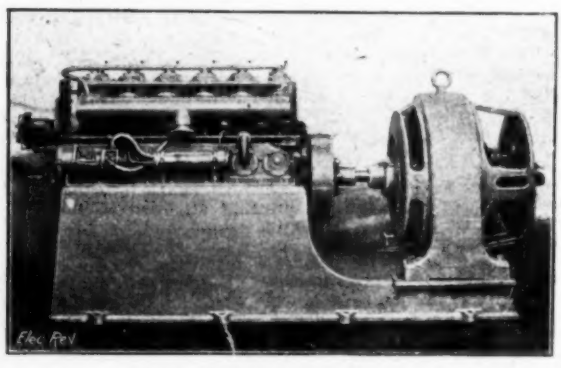


Fig. 2.—42-kW Generating Set.

Accurate grinding is a feature of the cams, crankshafts, pistons, &c. The engine runs at 1,000 r.p.m.

We understand that this type of unit follows closely the design of the first model produced, differing only in features which govern accessibility, silence and increased efficiency. The generator is a d.c. "Crompton" D.B. 60 model, directly coupled to the motor and having an output of 42 kW at 470 V, 1,000 r.p.m. It is compound wound, of the standard open bracket type, and conforms, it is claimed, with the requirements of the latest B.E.S.A. specification. The combination is mounted upon a cast-iron bedplate giving it adequate rigidity, and is an example of the British produced plant for which oversea demand is increasing.

"Mazda" Decorative Lamps.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2, has produced a convenient and safe means of decoration by small "Mazda" lamps. This consists of a plug adaptor from which issue eight or sixteen pairs of leads. To each pair a 14-V, 7-W "Mazda" lamp in an M.E.S. lampholder is attached. The lamps can be supplied in a variety of colours. The eight- and sixteen-pair sets are for use on 100/130-V and 200/260-V circuits respectively.

A Novel Electric Clock.

An electric turret clock with a detachable centre, fig. 3, is a recent production of the SYNCHRONOME CO., LTD., 19, Caxton House, Westminster, London, S.W.1. This construction is rendered possible by the installation of a one-wheel electrical impulse movement behind the centre of the dial, which is controlled from the master clock. The outer ring of the face

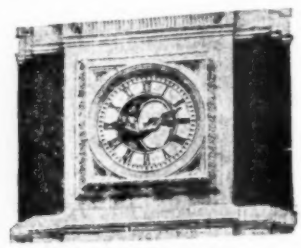


Fig. 3.—Electric Clock with Detachable Dial.

carries the hour figures and minute marks and is permanently attached to the building in the ordinary manner, while the centre panel is a separate construction buttoned into position; it can be hinged or altogether detached and drawn inwards, thereby providing access for attention to the movement, hands and clock face.

A New Pattern Flame-Proof Switch.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has made an interesting addition to its range of flame-proof switchgear by the production of the 10-ampere combination, illustrated in figs. 4 and 5, which embodies the "D.B. Junior" d.p. switch movement and Home Office pattern cut-out interiors, mounted in a heavy cast-iron case

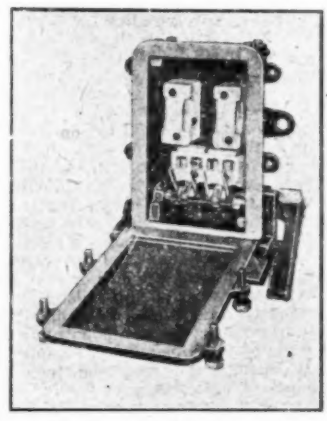


Fig. 4.—Flame-Proof Switch, open.

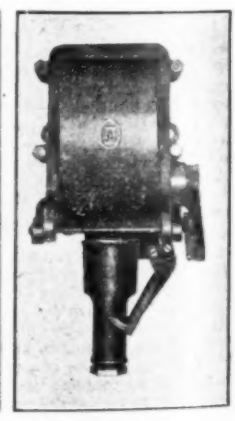


Fig. 5.—Flame-Proof Switch showing interlocked plug.

with wide machined flanges. It is provided with detachable top and bottom plates to accommodate standard flame-proof glands, and flame-proof cable-dividing boxes can also be fitted in place of these when required. It is of robust construction, and is specially designed for service in mines and other situations where explosive or inflammable gases are present. It is equipped with an interlocked plug combination suitable for connecting to portable apparatus.

The Need for Profitable Production.

The Financial Problems of Industrial Undertakings.

By J. S. HIGHFIELD, A.K.C., M.Inst.C.E., M.I.E.E.

(*Abstract of Presidential Address*: JUNIOR INSTITUTION OF ENGINEERS.)

THE times are difficult! How many of us have had to direct or manage a business which has fallen on evil times? Our talk, no matter what the starting point, drifts round to the general state of trade and the future of the Empire.

The problem can be solved only by steady, patient, unselfish work on the part of every individual who has the chance to help by providing useful work, if only for one man who lacks a job. Government cannot solve such a problem except by removing, when possible, restrictions which stand in the way of the citizens who elected it. One of the best ways for the ordinary man to help is by buying home-made goods.

The success of the country as a whole depends on the cumulative success of those who are engaged in producing food, clothing, housing, or the means of attaining these necessities, and so long as the average flourish, all is well with the State. Consequently, the difficulties which beset an individual producer in some small measure parallel the difficulties of the State of which that producer forms a tiny part. Considering the re-establishment of a business which has approached the state of bankruptcy, the first condition to be faced by those managing the business is that no one else will lend them money; their credit has gone; and since those who managed the business brought it to the state where the incoming revenue was less than the outgoing payments until its money and credit were exhausted, it is usually necessary to call in an outsider to try and put matters right. A manufacturing business selling its products all over the world consists of some hundreds of shareholders, which has borrowed as much capital as it was able to do in the form of debentures secured on the property. Assume that its sales are just sufficient to meet all charges for raw material, rent, rates, and management, with nothing for directors' fees or for interest on its borrowed capital, and that its sales are falling. Anyone called in to put matters straight must first find money enough to carry on. If neither the shareholders will subscribe for additional shares, nor the debenture holders lend more money to protect the sums they have already lent, he must apply to outside persons. These will certainly refuse to lend money unless they can have the right to the first proceeds of a sale of the plant in the event of the venture failing, and their terms will be onerous in proportion to the risk.

In these circumstances the factory and plant have ceased to provide any free money, they call for money to keep them going; the asset has become a liability. Assume that there exist contracts, or promises of contracts, sufficiently hopeful to persuade the debenture holders to advance further money as a first charge, conditionally on the shareholders giving up, say, four-fifths of their holding and that (until the sum borrowed be repaid) they are to receive 1 per cent. extra interest on their debentures; thus putting pressure on the management to repay the loan as soon as possible.

Having obtained working capital, the next move is to reduce costs so that the money may last as long as possible. Out of several processes one or more may have lost money for years; these must be closed down and men and staff paid off. Every source of waste must be stopped, and salaries may be reduced, or expensive men paid off to make way for less expensive ones; idle men must mend their ways, or go. This process involves hardships to individuals; it is sad and distressing, but it must be carried out, or the whole enterprise be abandoned.

On the revenue side strenuous efforts are made to complete outstanding work as speedily as possible in order to obtain payment quickly and to reduce cost. New orders must be obtained, even at low prices, but not at losing prices. Only when the business succeeds can it afford to face, for a time, losing prices.

This brings me to the human side of the difficulty. During the time that has elapsed since the dangerous position was faced, the new man and the directors have been working all hours, negotiating with difficult shareholders and debenture-holders, with bankers and others who might help; discussing difficulties with busy men whom they could only meet out of hours; anxious and difficult discussion with many overworked and harassed men. Such is the position of many men at the head of affairs, especially in these difficult times. Meanwhile, men on the staff have wondered how long their jobs would last, the best have wondered what they could do to help, filled with vague feelings of anxiety. A friend of the firm writes from Central Africa that if it can reduce the price of some article from, say, 1s. to 9d., he can sell many thousands to natives. Word comes from a large town at home that an order worth many thousand pounds can be gained at a certain price. These orders, if obtained, would ensure work for twelve months for all hands and more. The new man and his staff examine eagerly all possible means of bringing the estimate of cost to the needful figure, and, when all is weighed up, find that only if a greater output per £1 of wages is obtained can they make ends meet. They should then be free to explain the case to their men with confidence that they would be listened to and supported. I have known cases where this has been done and an order obtained. It should always be possible. Consider the situation: To obtain these orders means plenty of work for all, either at the same wages and hours if greater output be given, or at the same wages and more hours if the individual output is already at a maximum. The extra effort either way means that the business and the steady employment it has provided for years may, by the joint effort of all, not only continue, but increase. Without the extra output everyone will be out of a job.

I assume that the designers, before the men are approached, have done all they know to improve details of design and shop methods to save money in every way; that is the designer's job; also that those responsible for arranging the supply of raw material, the methods of packing, and the freight rates, equally have done their best. Further, that the men agree to satisfactory terms, and the orders are obtained. It is then that orders for raw material are placed and the works start to manufacture; wages have to be paid week by week, and the borrowed money drawn on to pay for raw material, wages, rent, rates, and all other charges. In due time the goods are shipped and payment is received. The margin of profit is narrow, and you can imagine the close watch that must be kept on expenditure to make sure that the work will be done so that at the end of the contract the money received exceeds the outgoings. Any delay in the shops, any delay in the delivery of raw material, any bad workmanship will add to the cost and so put the venture in jeopardy.

But this is only the first step for the new man; he has, I assume, secured work only for one year. The obtaining of new orders depends on the promptness and skill with which his first work is executed, and if the works have in the past borne a good name he is greatly helped. That is goodwill won by past honest efforts and has itself a market value; it is a source of credit. I assume all goes well, and that at the end of the year not only has the original sum borrowed not diminished, but that a considerable sum has been added to it. I assume that new orders have been obtained, that methods of reducing cost have been evolved, that the output per man has exceeded expectations, and thus that the same goods can be offered at a lower price, but with a better margin of profit.

If this margin continue year by year cash will accumulate. Interest on the old and new debt will be paid, but no dividends; all excess money will be conserved until the day arrives when the new money borrowed to keep the works running can be repaid. This step will at once lead to reduced cost. First, if further money be required, it can be borrowed at less interest than the onerous terms necessarily charged when the risk is great, and the added 1 per cent. is saved on the interest on the original debentures. If no further cash is required the whole interest is saved, and the annual amount added year by year to the cash resources. This money is used to buy new machinery to replace old, to provide new shops, which again produce added profits, so that another red letter day arrives when the cash surplus is so large that dividends on the share capital may be resumed.

A condition made by the lenders of the money that enabled the works to be restarted was that the ordinary shares were to be written down from £5 to £1 each. Prosperity is not restored to the shareholders until their shares can be put back to the original value by skill and hard work and saving, by keeping in hand more money than goes out.

The undistributed profits are added to the reserve fund, and on a later and still more glorious day these undistributed profits, really the savings of the shareholders, enable their losses to be restored, but after many days.

The next stage is that, with increasing dividends, the value of the shares increases until the time comes when, if more money is wanted, the shareholders will advance it, even to the extent of paying 30s. for a £1 share. At this stage the business is usually called a rich company. What does rich mean?

I assume the capital of my business to be in the form of ordinary shares and that it has borrowed £20,000, and that at the time when it may be described as rich the contents of its accounts are as shown in Table I on the following page.

Now observe that the real protection to the business is the amounts put aside to reserve and depreciation; in the above case they represent 15 per cent. of the gross income and one-half of the wages bill. This sum can be used to purchase new plant at least in part, for experimental purposes, or for any venture which may, if successful, lead to increased profit. There is no hard and fast rule by which to calculate the proper amount to place to reserve or depreciation. The calculations as to the life of the plant—to use accounts' jargon, "the physical life of the assets"—are useless, because invention by yourself, or, worse still, by your competitor, may at any time make much of your plant obsolete; that is to say, you cannot afford to run it. Only experience and complete knowledge of

every likely turn in your trade are of use, and prudent care is the best guide for settling the amount that should be put to reserve.

Table I.

Share Capital		£100,000	
Debentures		20,000	
Cash		5,000	
Reserve		20,000	
Gross receipts			£100,000
Costs :—			
(a) *Not wholly under control* :—			
Raw material	£25,000		
Rates and taxes	2,000		
Freight	2,000		
Power	2,000		
		31,000	
(b) *Under control* :—			
Wages	30,000		
Management and general charges	13,000	43,000	74,000
Surplus			£26,000
Application of Surplus :			
Interest		£1,000	
Depreciation		5,000	
Reserve		10,000	
Dividend on ordinary shares ...		8,000	
Carried forward		2,000	

So far we have been considering and admiring the forethought and skill of the new management, the accuracy of the designers, and the whole-hearted ability and industry of foremen and men, but of the total income of £100,000, £31,000 has been paid to outside people, £25,000 for raw material, £2,000 to rates and taxes, £2,000 to the railways and shippers for freight, £2,000 for power. These sums, more than the dividend and reserve, are all paid to outside servants of the producers. Are they giving full value for the money paid them? If they fail to work "all out," they are a drag on our business. At the present time these people receive too much for their services—wages more than the producers receive. The producers find the money to pay them; therefore the producers should see to it that they call the tune. Wages account for £30,000, and the shareholders have £8,000. The new manager sees his reserve ample; he is paying 8 per cent. to his ordinary shareholders, and profits grow. What should be done with the added profits? Prices, I assume, have already been reduced, and his own pay and that of his staff have already been increased. Foremen and men should also share; probably the former have already received bonuses, but the men should share also, and here sometimes comes the difficulty owing to the system of collective bargaining, which tends to make the wage rate equal for equal work, no matter if the business be failing or prosperous. This is a most unnatural arrangement. It prevents a man ever enjoying good fortune; he may also suffer bad luck, which comes to all, even if it were possible to secure to all a regular income. Therefore, surely to deny to man the enjoyment of good fortune is to take away from him the chief incentment to effort! No, when the works prosper, the men who have helped to its prosperity should be rewarded with a share of the surplus, but if they enjoy a surplus, another time of danger is reached. What will they all do with it—the new managers, his staff, his men, and the shareholders? The answer is clear. The surplus they enjoy is due, apart from hard work and skill, to prudent use of profit when it was gained. Therefore, let every man enjoying a surplus preserve it in the same prudent way, invest it in something that is productive. Thus each man in the works becomes a capitalist. The elements of success are determination, courage, daring, steady application, skill, faith, and thrift. Very few men possess all these qualities and characteristics, and far fewer still have the capacity to impart them to others. If you find a true experienced leader, follow him.

The few figures I give show how small is the margin which separates the successful from the unsuccessful business. In the early stages of the business I describe the slightest accident would have resulted in the works being no longer a source of livelihood to many men, a source of prosperity to its environment with rate collectors, road menders, railwaymen, sailors, and government officials receiving payment from its production. Faulty designs, a strike of its own men, or a slowing up of their work, would have made those first contracts unprofitable; a stoppage in the works supplying raw material, a stoppage involving delay in railways or shipping would have prevented the contracts being completed in due time, and would have added to costs. Any of these causes would have brought the venture to ruin. Thus does each man depend for his daily bread on the constant efforts of his fellows.

Who builds a works or a ship? Why, those who have enjoyed a surplus above what they require for their living expenses. And how is the works or ship built? First, with accommodation for the men who work them, and in a ship living accommodation is also provided. And the accommodation is provided and the works built in the belief that men with sufficient skill will work and use works or ship for various other men who will pay for the service rendered; in the faith that the men who work will do so in such wise that in due course the cost will be repaid with profit. Destroy this faith and ordered civilisation falls to the ground, and we go back to the days when each man grew just as much food as he needed and with such difficulty that when his precarious crop failed he robbed, if he were able, his neighbour.

Civilisation started when the average man in a working day began to grow more food than he required. He then fed the other man while he forged him a new plough, again increasing his output in the same time, and so leading to a greater surplus. All trade is built on the output of the farmer and the fisherman, and on trade rests the ordered life of civilisation. But to-day we suffer from a sad demoralisation of values caused by the war. Some of our old markets have gone; some of our old customers are bankrupt. In time, but only in time, by the methods of my new man will they restore their prosperity, and with their help ours: but only if we render them service at reasonable prices.

I think there is a growing understanding of the relative values of different classes of work. I believe there is a better knowledge of the absolute necessity of successful production of everything that may be grown, or won, or manufactured. Those engaged in these trades are the basis of all. The carriers, the railways and shipping and other forms of transport all depend on production. Electricity is one great means to this end. Consequently the welfare of the producer should be the care of all. It should be the first business of government to see that the man who ventures into the field of direct production has a fair chance to succeed. The man who seeks a large salary with a pension is a greater man than he who seeks a small salary and a pension; both, however, can enjoy their salary and pension only if the direct producer provides the wherewithal. I am not despising the salary earner. I only want him to remember that he is secondary to our producer, and that his job is to give loyal and skilful help to the man who provides the foundation on which his salary and pension rest.

Figures are a dull subject, but they reveal subjects of moving moment to every engineer. I have analysed the essential figures of various industries, taking the revenue to be 100, and worked out the other figures as percentages. The Table II subdivision is only approximate: for instance, the management can determine the quantity of raw material purchased depending on economical use, such as the quantity of coal used in a power station. Again, the rate of wages is but little under control, though the number of men employed is, but the broad division, despite some overlapping, is useful. Eight per cent. would generally represent 6 per cent. on the preference, and 10 per cent. on the ordinary, shares. The shareable profit is all that is available for profit-sharing schemes.

The figures of the electricity supply undertakings show that in all cases the costs in division A exceed those in B; that the total working expenses are about one-half the revenue, and that the capital expended on works is from three to five times the amount of revenue; in other words, the rate of turnover is small. Nos. 1, 2, 3, 4, mainly supply urban lighting; about one-half the revenue is derived from this source. Nos. 5 and 6 derive 90 per cent. of the revenue from power, that is why the percentage payment for coal is high.

From the coal figures it follows that more capital can be spent on means to economise in the cost of coal in 5 and 6 than in the others. Note that the wages are always less than 15 per cent. of the revenue, and that rates and taxes are a very important item of cost. The most important part of the cost, however, is the payment on capital in the third division, nearly one-half the total. For this reason the greatest care must be exercised in its expenditure, and in the equally important question of finding the money cheaply. The cheapest method is, first, to make ample provision for reserve, to use a large portion of profits to buy new plant; this will aid the next important matter, to provide for paying a sufficient dividend to attract the investor who will always invest his money where it is secure, and the best test of security is ample reserve and dividend.

Let us now study the figures for works and mines :—

No. 1 produces heavy machinery, and the ratio of capital to revenue is much less than for the electricity supply undertakings. The ratio of (*a*) to (*b*) costs is much higher and the balance of revenue over costs is negligible. In other words, there is no profit, and this unfortunately is the position of many heavy engineering works to-day.

No. 2 produces light apparatus in large demand; the capital is only 19 per cent. of the revenue and the surplus of revenue over costs is nearly 75 per cent. of the capital. The small capital and large turnover indicate that the plant is very fully employed, and a large sum is required to write off the value of the plant in a very few years, because it will be worn out quickly. The figures are typical of works producing cheap articles by mass production, articles in large and common demand. If the articles are made by a patented process prices can be for a time maintained. If not every year, it will be found that prices must be reduced owing to competition in various forms, and, consequently, very large sums must be put to reserve to provide for new machinery, either to reduce cost, or increase output, or both. The rate of dividend will generally be high in good years, but usually cannot be long maintained.

In both works, wages and salaries are nearly 35 per cent. of the total costs. The rate of turnover is an important figure that has a great effect on the cost of the product; if the ratio to capital is one, then, if each article carries a clear 10 per cent. profit, the profit on the whole capital is 10 per cent.; if the turnover can be increased to two, the profit per article can be reduced to 5 per cent. and still yield 10 per cent. on the capital. Consequently, a high rate of profit where the turnover is large usually exists side by side with the production of articles each carrying a very small rate of profit. In this case the costs are 86 per cent. of the revenue, leaving 14 per cent. surplus, and

since the turnover is about five, it follows that the surplus per article is less than 3 per cent. In these conditions the closest watch over costs is necessary to prevent the small rate of profit per article turning into a small loss, which would involve a large total loss.

Now turn to the figures for mines. Nos. 3 and 4 represent colliery figures for 1913 and 1924. I cannot say whether they are typical, but at any rate they are illuminating. Whereas in 1913 a capital of 39.8 produced a revenue of 100, in 1924, 56 was required to produce the same percentage revenue, showing a decline of turnover. Wages were 54 in 1913, and 70 in 1924. Management declined from 10.8 in 1913 to 7.3 in 1924. In 1913 the total costs were 90.8 per cent. of the gross revenue, the surplus of 9.2 per cent. being placed to reserve or carried to next year. In 1924 there was a deficit of 6.8 per cent. of the gross revenue. Since prices had already been increased, the result was clearly due to reduced output, and it is obvious that, if this condition continue, the colliery must soon shut down.

Note the varying profit-earning capacity of these few examples. There is no sure way of maintaining profit at constant value, although it is more easy to do so in one business than another; but no matter what care be taken at some time or another a business must face a loss, when it can only be kept going by the owners finding money to meet the losses. The profits, therefore, must belong to those who are able and willing to shoulder the losses. I include in this category shareholders who put up with reduced dividends without unreasonable grumbling—they are few; directors who forego fees and often assist the finance; also men on the staff or in the works who either put in more work for the same money, or take less money in order to keep the enterprise going. All are in their several ways shouldering the losses.

Finally, there are no shareable profits in some of my examples; in the best a reduction of only 5 per cent. in the selling price would wipe out this item. The amount can be increased, either by increasing the selling price, or reducing some item of cost, but in any event experience shows that this amount can be attained only with most excellent and wholehearted endeavour on the part of all who work the enterprise.

Apart from any payment depending on direct work, many men will save money. It is well if the men employed in any business invest at least a part of their savings in the buisness.

There is, I think fortunately, a growing tendency to facilitate such investment. I am not inclined to believe in creating any special form of security for the purpose; the employés should stand, in this respect, on an equal footing with other shareholders; however, facilities could be readily provided to make it easy for any employés to acquire either ordinary or preference shares, or to take a part in providing capital in the form of loans. The value of each class of capital should be made clear, and a scheme enabling shares to be acquired by weekly contributions would help. A limited liability company was for long regarded as a bad invention, and no doubt the change from private firms involved much hardship. There was the loss of a clear undertanding of the joint interest of all concerned in working the company. The master was not personally known to his men.

Modern production has, however, been built up on the company system and could not exist without it, and there has grown up a better knowledge of how to govern and work these great organisations. The constitution of a company is fully democratic, every shareholder has votes in proportion to the number of shares he holds. If everyone in the country, and especially men in their own works, held shares, then it would be to the common interest to care for the welfare of the business as an owner. It is for this reason that the wider holding of shares in producing works should be encouraged.

I have chosen a dry subject, but one which engineers should consider; it is one which all managing engineers must consider. It is important and the main elements are, or can be made, relatively simple; it is merely the difficulty of seeing the wood rather than individual trees. There are too few businesses involving engineering managed by engineers, but unless they learn the elements of money management, and above all the supreme necessity of managing them profitably, they are unqualified for the job.

I am sure that there are many engineers with the natural qualification for management who could usefully give their close attention to the study of business essentials.

I am directing your attention essentially to the problem of improving trade, to the duty of facing the present difficulties as our forefathers faced them in 1816. At that time engineers had a great hand in restoring prosperity. Their inventions were important, but equally important were the results on the minds of the men who in rapidly increasing numbers were drawn into the work of manufacturing and improving these inventions. The great fruitfulness of new ideas is in stimulating the minds of lesser men to think a little in terms of the unknown, and to forget the shibboleths of their normal work. Trained engineers will give the best service in inventing and scheming new designs and methods aimed at greater efficiency and less cost. There is any amount of work in these directions, and British brains are as good as any.

Manufacturers might help young men with ideas to develop their talent. A surprising number of firms manufacture plant under foreign patents for which they have paid large sums.

TABLE showing the proportions of the gross receipts required to meet the several items of costs, including capital for various manufacturing and other business s. All the figures in this table, except the figure for gross receipts, are percentages of the gross receipts.

	Electricity Supply Undertakings.								Manufacturing Works.			Colliery.	
	Company.					Municipal.							
Capital: Loans	—	141·1	221·5	18·1	325·4	448·4	302·4	503·6	—	—	23·0	—	—
Shares	264·8	172·9	213·5	180·0	252·5	—	—	—	128·2	19·0	113·0	39·8	56·0
Total	264·8	314·0	435·0	198·1	577·9	448·4	302·4	503·6	128·2	19·0	136·0	39·8	56·0
Capital expended	318·2	384·2	555·2	263·0	461·8	438·8	368·4	5 9 6	—	—	13·5	—	—
Gross receipts	100·0	00·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
Costs:—													
(*a*) Not wholly under control—													
Raw material	20·0	20·3	19·8	52·0	36·6	22·6	17·8	26·9	62·5	54·2	1·4	16·0	16·3
Freight	—	—	—	—	—	—	—	—	0·8	0·4	17·3	8·2	9·1
Rates and taxes	12·1	11·2	7·7	2·3	3·2	8·3	8·9	10·3	4·8	0·2	9·4	1·7	4·1
Total	32·0	31·5	27·5	54·3	39·8	30·9	46·7	37·2	64·1	54·8	44·1	25·9	29·5
(*b*) Under control—													
Wages	12·2	13·5	15·6	5·8	14·6	14·9	11·9	10·1	20·5	24·2	23·2	54·1	70·0
General charges, designing, sales, H.O. expenses legal directors' fees, and management ...	9·7	7·7	5·5	7·4	9·2	11·8	8·0	5·1	15·0	7·0	7·8	10·8	7·3
Total	21·9	20·2	21·1	13·2	23·8	26·7	19·9	15·2	35·5	31·8	31·0	64·9	77·3
Total of (*a*) and (*b*) ...	53·9	51·7	48·6	67·5	63·6	57·6	66·6	52·4	99·6	86·6	75·1	90·8	106·8
Surplus of revenue over costs	46·1	48·3	51·4	32·5	36·4	42·4	33·4	47·6	00·4	13·4	24·9	9·2	6·8
(*c*) Charges relating to capital—													
Interest on borrowed money ...	—	10·2	13·7	0·9	20·1	14·7	7·1	15·0	—	—	0·5	—	—
Sinking funds, depreciation, and reserve	21·5	20·8	18·7	17·2	15·4	27·7	19·7	32·6	—	9·6	12·7	9·2	—
Balance, being amount available for dividends on share capital or other purposes	24·6	17·3	19·0	14·4	0·9	—	6·6	—	—	3·8	11·7	—	—
Amount required to provide 8 per cent. dividend on share capital	21·2	13·8	17·1	14·4	20·2	—	—	—	10·2	1·5	9·0	3·2	4·5
Sharable profit	3·4	3·5	1·9	—	—	—	6·6	—	—	2·3	2·7	—	—

NOTE.—The method adopted in preparing this table is to take 100 to represent the gross receipts from all sources, the amount of capital and costs under their various headings being shown as percentages of these gross receipts. The costs are divided into three parts:—
(*a*) The sums paid to outside parties for raw material, freight, rates, &c., over which the management has little or no control;
(*b*) Costs, such as wages, management and overhead charges, over which more or less control can by exercised by the management;
(*c*) Capital costs, being interest on borrowed money, sinking funds, depreciation, and reserve; and amounts paid to shareholders in the way of dividends.

Many of these inventions have required great modification before they would work, sometimes until little of the original was left, and often far less sums spent on home-made designs would produce at least equal results in less time and with the great advantage of encouraging native talent.

One other requirement of paramount importance is leadership, and in pressing the importance of working for profitable production, I wish to make it quite clear that profit is only a means to an end. Profit is the simplest and surest means of measuring efficiency of production, always provided that the total sum of profit as well as the rate of profit is used as the unit of measurement. A high rate of profit on small production is usually attained only when some restriction of output, or use, can be set up. This method may be described as profiteering.

Production may relate to true luxuries, such as diamonds, or it may relate to articles which should be sufficiently cheap to be in common use, but which, for a time, are made luxuries by restricted output. Houses are necessities; motor cars were luxuries, but owing to restrictive action, on the one hand, and to the use of sound business principles, on the other, the position has been reversed. Small houses are almost a luxury, and small cars almost a necessity. Had the same skill and effort been applied to the construction of small houses as to the construction of small cars, the housing problem would have been solved, and the builders would have realised a large profit rather than a high rate of profit. Profit is a rough standard of measurement of efficiency in the conduct of business, and without efficiency no surplus can be gained.

I have dwelt on the importance of all concerned in industry working together for a surplus, not as an end in itself, but as a means to an end. Having gained the surplus, its proper use will enable us to progress in all the things really worth doing: refinements of artists, both in industry and in art, and in all the things really worth having; those enduring possessions necessary to good fellowship, which are the joy of life.

Electrical Development in New Zealand.

Opportunities for British Manufacturers.

By "HOMIE."

THE electrical development of New Zealand is proceeding at a rapid pace, and there are now eighty-seven Power Boards or distributing authorities supplying various areas in the country. The total population included in those areas of electric power supply is 930,980, or over 70 per cent. of the total population of the Dominion, so that the ideal of a supply being available to every home in the Dominion is well on the way to realisation. In the past year the number of consumers supplied has increased from 124,705 to 148,699, an increase of 19 per cent. Out of the eighty-seven distributing authorities, fifty-nine showed a profit for the year amounting to £162,376, and twenty-eight showed a loss amounting to £36,492. The general result was a net profit for the whole Dominion of £125,884, after paying working costs (£780,826) and capital charges (£732,086) at the rate of 7.6 per cent. on the total capital outlay of £9,566,589. This shows a net profit of 1.31 per cent., as compared with 1.85 per cent. last year. The business on the whole is thus a thoroughly sound and remunerative one, as well as supplying a public necessity to 70 per cent. of the population of the Dominion.

Mr. F. T. M. Kissell, the Chief Government Electrical Engineer, in his annual report, after stating that negotiations are taking place with the authorities concerned with the revision of the rules for wiring which will shortly be reissued, says that another matter somewhat allied with the regulations is the question of testing and approving all kinds of apparatus brought into the country for use by consumers. A certain amount of this inspection is being done by the local authorities and by the fire underwriters; but the electrical development in the past few years has been so great that it is extremely doubtful if this important matter has been receiving the attention that is necessary to maintain a high standard of installation throughout the country. Consideration is being given to the establishment of a central testing laboratory, and approval board, specially to deal with all types of appliances imported into the country, to carry out tests on plant and apparatus for local authorities, and at the same time to do a certain amount of experimental and research work on problems peculiar to electrical development in the country.

It will be seen from the above statement that all imported goods have to be of substantial construction and a high standard of efficiency; and manufacturers in Great Britain should make note of this when offering their goods for sale in this country.

There is great scope in the Dominion for British manufacturers, especially of domestic appliances, and it strikes one as being very strange that there are so few of them represented here. Most of the material for installation work is British made, but it is in the hands of a very few firms, and regarding domestic appliances, they are almost wholly of American manufacture. There is no duty on material, apparatus, or machinery used in electrical development, or for installation work, but all domestic appliances imported are liable to 20 per cent. duty for British goods and 30 per cent. for foreign goods. Taking into consideration the extra cost of freight from Great Britain, the British manufacturer ought to be able to export goods to New Zealand to compete with American products, as he has less duty to pay. Even if he did not want to take the risk of exporting goods, or the expense of opening a branch in the Dominion, if he would only advertise his wares and send catalogues and price lists, with shipping dimensions and prices f.o.b. to the wholesale factors and electrical contractors, I am sure he would be amply repaid for his trouble. The manufacture of goods in the Dominion is absolutely prohibited by the high cost of labour, and the British manufacturer's only rival is the American.

The writer is of the opinion that it would be a very good idea if British manufacturers would state the prices of the various parts of their appliances and the shipping dimensions, as a number of the firms in the Dominion would be keen on manufacturing some of the parts themselves that could be economically produced, importing the other parts from Britain and assembling the appliances. There are various parts of electrical appliances that could be imported duty free, such as stampings, enamelled ware, mica, resistance wire, &c. The number of duty-free parts is far too numerous to be detailed in this article, but the Dominion manufacturer could easily find out which parts it would be cheaper to produce and which it would be cheaper to import, and combine them for the finished article.

The following extract from the report by Mr. Kissell will show that there is an enormous field for domestic appliances throughout the whole Dominion:—

> "Most of the newly-formed boards are building up their loads at a faster rate than was contemplated, and the loads will considerably exceed the amounts they have guaranteed. It is anticipated that there will be a considerable increase in the domestic loading, particularly in electric ranges and hot water heaters. Returns have been obtained of the electric ranges in service in the areas of the different electric supply authorities. The total number of ranges connected is 1,526, which means that 1.02 per cent. of the total number of consumers are enjoying the advantages of electric cooking. The total number of supply authorities is eighty-seven, and of these fifty-five, or 62.5 per cent., have electric ranges connected to their systems. One supply authority has no fewer than 475 ranges connected. The total number of consumers in this district is 22,491, which gives a figure slightly in excess of two ranges to every 100 consumers. Three other supply authorities, however, have figures corresponding to over five ranges to every 100 consumers. When it is realised that some of the largest percentages are being obtained in districts in which the power has only been available for a few months, it is evident that a large increase in demand can be looked for when the authorities embark on an active canvass for this type of load. It is also particularly gratifying to see that the advent of electric power is bringing conveniences to the rural districts which should greatly improve the conditions of living therein."

There are no statistics available for other types of domestic appliances, but there are very few appliances such as vacuum cleaners, kettles, washing machines, fans, &c.; and as for that most indispensable article, the electric iron, the writer is certain that not more than 30 to 40 per cent. of the consumers have one. As the weather is never very cold except in some parts of the South Island, the demand for radiators is not very great, apart from a call for some of the smaller portable types. All that remains, then, is for British manufacturers to get into touch with some of the electrical firms in the Dominion and commence a great advertising campaign which will create a demand for British-made electrical goods and appliances, and now is the time to do it while the industry is still in its infancy. The writer's advice is: Get into it now and oust the American article from the market before Americans get the complete monopoly of the industry.

Electro-metallurgy in Norway.—The report for 1924-5 of the Porsgrund Elektrometallurgiske A.S. states that sale conditions were better than in the previous year, and prices were also good when considered in Norwegian kronen. The reorganisation of working which was commenced two years ago had yielded very satisfactory results. The net profit for the year is returned at 200,056 kr., and it has been applied partly to wiping out former losses. The prospects are said not to be bright owing to the confused power situation and the appreciation of the krone.

Electricity Supply Standards in France.—The French Government has recently issued regulations setting forth the standards to be adopted in connection with electricity distribution in France. The order provides that the standard type of current shall be three-phase a.c. with a frequency of 50 cycles per second. The use of d.c. or single-phase 50-cycle a.c. may, however, be authorised for important transmission lines, for traction purposes, and in certain rural areas. The standard voltages are as follows:—For d.c., 115, 230, and 460 V; for single-phase a.c., 115 and 230 V; for three-phase a.c., 115-200, 230-400, 1,000, 3,200, 5,500, 10,000, 15,000, 22,000, 30,000, 45,000, 60,000, 75,000, 90,000, 110,000, 150,000, 220,000 and 300,000 V. It is further provided that the Minister of Public Works may, after consultation with the Government Comité d'Electricité, permit variations from any of the standards.

The Faraday Society.

Two papers of electrical interest were contributed to the November meeting.

An Electric Vacuum Furnace.

Prof. J. R. PARTINGTON and Mr. W. L. ANFILOGOFF described an improved form of furnace of the Ruff type which they have found highly satisfactory for studying reactions at temperatures approaching the volatilisation of carbon. The furnace consists essentially of a graphite hot-tube surrounded by a radiation case to prevent loss of heat and enclosed in an air-tight water-cooled cast bronze casing. The graphite tube is sufficiently thick at the ends to allow the passage of the maximum current without getting hot, and sufficiently thin in the middle to give the necessary resistance to the current to obtain the requisite temperature. The radiation case consists of two cylindrical concentric graphite tubes, held in position by two graphite plates and supported by four magnesite cubes. The reacting substances, if solids, are placed in a graphite crucible set in the hot-tube, the inside of which may either be maintained as a vacuum or as an atmosphere of an inert or reacting gas. The paper contains a full description of the method of making and setting up the furnace, with complete working drawings.

The Correlation of the Permanent Magnetism and Specific Resistance of Some Pure Iron-Carbon Alloys.

This was the subject of a paper presented only a few weeks before his death by the late Prof. E. D. CAMPBELL, of the University of Michigan. This author had long been carrying out systematic work on the correlation of chemical constitution and magnetic properties, based on the idea that the latter might be partly due to solutes in solid solution and partly to the solvent iron. To reduce the problem to its simplest form a pure series of iron-carbon alloys had to be made, in order to eliminate the influence of other elements. In the present paper are described the magnetic properties of a freshly hardened and a slightly tempered series of alloys as measured by means of a special magnetic balance. These values are compared with the specific resistance of the hardened bars and with similar magnetic properties and specific resistance of very pure electrolytic iron. The tests, in the case of the alloys, were made on round bars 6.3 mm. in diameter and 15 cm. long, the carbon content of which varied from 0.05 to 1.50 per cent. The heat treatment was such that the carbides were as completely as possible in solution.

The experimental results show that increase of specific resistance of the alloys is almost proportional to the carbide concentration. The magnetic resistance increases more slowly than the specific resistance up to the eutectoid concentration, but more rapidly in the hypereutectoid alloys. This would appear to indicate that in order to keep magnetic resistance low it is necessary to have structurally free ferrite. The internal magneto-motive potential, to the presence of which is due the maintenance of a permanent field of force, increases rapidly with increase of carbide concentration to a maximum at about 0.60 per cent., after which there is little further increase. The considerable difference between the magneto-motive potential required to demagnetise the system and the internal magneto-motive potential would seem to indicate that while a considerable amount of energy is required to magnetise or polarise the solvent iron, the internal magneto-motive potential of this iron is quite small compared with that due to dissolved carbides whose force-fields have been brought into serial alignment by magnetisation. The maintenance of a permanent field of force at each end of a bar magnet is due to the presence of an internal magnetic resistance in the system, and it would seem to necessitate a continuous supply of energy to the magnet equal to that lost by open force fields.

No other solutes in iron seem to possess a magneto-motive potential comparable with that of dissolved carbides, although both the magneto-motive potential and the magnetic resistance may be modified by the presence of elements other than iron which have a stronger affinity for carbon than has iron.

Legal.

Extension of a G.E.C. Electric Fan Patent.

MR. JUSTICE TOMLIN, in the Chancery Division on December 16th, heard the petition of the General Electric Co., Ltd., for the prolongation of a patent for improvements in electric ceiling fans, of which it was assignee from Mr. P. S. Given. The ground of the petition was that the company had been deprived of the benefit of exploiting the patent owing to the intervention of the war.

MR. MORITZ, K.C., for the petitioners, said the patent related to electric motors designed to drive fans in a perpendicular position, such as ceiling fans. In that position there was a difficulty about lubrication, and the patent provided for the fixing of an oil-tight reservoir below connecting with a similar reservoir in the bearing above, which obviated the difficulty. Until the war the fans were making rapid headway with the public.

His Lordship granted an extension of the patent for three years.

B.T.-H. Litigation.

MR. JUSTICE TOMLIN, in the Chancery Division on December 15th, had mentioned to him the motion by the British Thomson-Houston Co., Ltd., for interim injunctions restraining alleged infringements of its electric lamp patents by E. A. Siderman, of Grafton Street, Tottenham Court Road, R. H. Wood, and W. T. Smith, Ltd.

MR. TREVOR WATSON, for the plaintiffs, said that on December 4th they obtained the injunctions *ex parte*. Messrs. W. T. Smith, Ltd., had now put in an affidavit to say that they had sub-let the wharf at Redhill Street, Albany Street, N.W., and therefore he was not asking for the injunction to be continued against them, and there would be no order against them, except that the costs would be costs in the action. Mr. Lavington, for R. & H. Wood, had asked for time to answer the plaintiffs' evidence. It was therefore agreed that the motion should be adjourned until the first motion day next term, the injunction being continued in the meantime. As to Siderman, he was to have been present, but had not appeared, and Mr. Watson asked for the same order against him as against Wood.

His Lordship assented, and made the orders asked for.

Weber v. Birkett.

IN the King's Bench Division on December 17th this case came up for re-trial before Mr. Justice Horridge and a special jury. The plaintiff was Major W. V. Weber, a Southend borough councillor, who alleged that the defendant, Mr. R. Birkett, borough electrical engineer of Southend, had libelled and slandered him. In the original action the jury awarded the plaintiff damages, but as they were unable to apportion the sum as between the issues of libel and slander, the judge would not accept the verdict.

Mr. E. CHARLES, K.C., on December 17th, said that the words complained of had characterised Major Weber as a hypocrite, guilty of treachery and unable to be trusted.

SIR HENRY MADDOCKS, K.C., for the defendant, said that his client had expressed his sorrow for what he had done. Mr. Birkett also appeared and repeated his apology. The jury awarded Major Weber £300 damages in respect of the slander and £450 for the libel. His Lordship accordingly entered judgment for £750 and costs.

An Electrical Trades Union Dispute.

MR. JUSTICE TOMLIN, in the Chancery Division, on December 18th, had mentioned to him two motions, Dennis and Others *v.* Cox, Arnold and Others, which related to the affairs of the London (East) Branch of the Electrical Trades Union.

Mr. GALBRAITH, K.C., for plaintiffs, said that the motions were before his Lordship on December 11th (*vide* our last issue, p. 970), and stood over for arrangements to be made to pay urgent benefits to members of the branch and to settle the actions, if possible. It had not been possible to settle the actions, but the benefits would be paid to the persons entitled to them. By arrangement, and subject to his Lordship's sanction, there would be no order in the motion except that the costs would be costs in the action.

His LORDSHIP assented.

Correspondence.

Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Overhead Distribution.

In reply to my letter in your issue of December 11th, Mr. Redgment is at some pains to claim that the residents of Brundall, near Norwich, thoroughly appreciate the electric power supplied from his pole-line down the village street. I have no wish to deny this, and, in fact, mentioned it in my letter, though the misplacement of a comma in the printing made the meaning perhaps somewhat obscure. Speaking of the present residents I said :—

"Though there is no doubt of their appreciation of electricity, for similar prospective owners a system of distribution which would look ugly in the outskirts of Manchester can hardly be classed as an attraction."

I do not suppose the residents now notice the poles, while Mr. Redgment, looking on them with the indulgent eye of a father, may by this time regard them as quite beautiful and a good substitute for the mangled trees.

It is possible to get used to anything, and one sees as a rule least of one's ordinary surroundings. Few people, for example, can describe accurately the pictures on their own dining-room wall, and I can even imagine nursemaids and their charges, in their daily perambulations in Hyde Park, passing "Rima" without a shudder.

But an ugly thing is not less ugly because certain people do not consciously see it, and the sub-conscious effect on them is probably equally unsatisfactory.

For long-distance transmission across country an overhead line is, of course, often the only commercial possibility. But I would suggest that we should recognise that it is ugly, keep it well away from the road (say, two fields off), give preference

to inconspicuous runs, and possibly go in for a little judicious planting of trees, as in the case of a recent gas-works scheme.

For local distribution in a fairly well populated area the overhead system has less to justify it from the point of view of capital cost, and much against it from other considerations.

Now, curiously enough, in the case of Brundall, the 6-mile transmission from Norwich is all underground, and it is only the distribution for about a mile each way that is overhead.

In the original article it was said that if the underground system had been adopted the cost to Brundall would have been something like four times as much. In his letter Mr. Redgment makes the definite statement that the cost of electricity would have been over double. This means that the interest on the *difference* in capital expenditure between the two systems on, say, a couple of miles, would have been greater than the interest on the whole of the present system (including long underground transmission and sub-station) plus the generating costs of the energy used.

Of course, one does not want to extract data from a consultant without fee, but in view of the importance to other villages I think actual figures would be appreciated in support of these statements.

S. E. Glendenning.

Norwich, *December 19th*, 1925.

The Metering of Three-phase Power.

As a meter engineer, I consider Mr. Malcolm is to be congratulated upon his very excellent article which appeared recently in your columns.

It is an indisputable fact that the importance of accuracy in respect of the methods employed for metering supplies of energy does not in general receive the amount of attention it should do, neither is it as yet universally recognised that meter work has become a "science of its own" and calls for more than the average amount of skill and intelligence if reliable results are to be looked for, or if the meter department of a supply undertaking is to be run on efficient and satisfactory lines.

The writer has himself at various times conducted a number of investigations with a view to determining to what extent the suspected sources of error in high-pressure metering equipment actually exist, and where they are found to exist in any appreciable degree, their exact influence upon the overall efficiency of the combined apparatus. The following is a brief survey of the conclusions arrived at.

In the first place, the question of "interaction" between the elements of a polyphase induction meter cannot, as Mr. H. H. Jaques asserts, be treated as a negligible quantity. It is true that the errors arising from this cause do not as a rule in themselves constitute any serious complication; it is only when they are acting in combination with other errors (either in the meters themselves or their auxiliary transformers, or both) that they have to be taken into serious consideration as affecting the accuracy of the combined equipment.

It is the writer's experience that the more likely source from which errors in registration are liable to accrue is from badly designed or inadequately rated auxiliary transformers used with the meters, or where such transformers in addition to operating the meters proper are called upon to supply current to indicating and recording instruments, trip coils, &c., or other apparatus capable of setting up induction in the circuit. For this reason it seems desirable that each meter or set of meters should be given its own transformers, and the connecting of devices other than the meters to them be strictly avoided.

Meters should always be calibrated together with their transformers, and very definite observations should be made at different points of the curve with the whole apparatus connected as for actual service conditions. If subsequent tests are taken *at the same points* but *without* the transformers, not only is information obtained as to the characteristics of the transformers themselves, but the data so obtained provide a very useful means of effecting any future adjustments to the meters more or less accurately, without the necessity of removing the transformers with the meters, which procedure is often inconvenient and troublesome.

The introduction of "check" or standard meters upon consumers' premises for the purpose of ascertaining the accuracy of the existing meters has been known to influence the characteristics of the secondary circuits of transformers, especially where these have not been over liberally rated. This condition is somewhat aggravated by the fact that where meters have been designed to function as "standards" they are usually, in order to obtain a good and permanent torque, constructed without regard to "shunt" or "series" losses; and whilst such meters are undoubtedly admirably suited to checking "straight-through" meters, they possess obvious disadvantages when employed for testing "on site" meters of the transformer pattern.

Other sources of error have been traced to the use of long and small-diameter conductors in the secondaries of current transformers. The effect is to "overburden" the transformer by increasing the resistance in this circuit, which results in bringing about an excessive ratio error.

Yet another cause of trouble, often met with, is the deterioration of the dielectric of these conductors, due often to leaking or spilled transformer or switch oil attacking it and creating the possibility of a portion of the current to be measured finding its way back to the transformers by paths other than through the meter. The same remarks apply of course if the meter itself has a low insulation resistance between its current-carrying parts and the metal case (provided this is earthed, as it should be). Slight or intermittent leakages of this description may go undetected for considerable periods.

The writer has in mind a typical case of this sort where for some apparently unexplainable reason there was always a large discrepancy between the readings of a pair of meters working together in series off a set of common current transformers having one pole of their secondaries connected to earth. Laboratory tests on the meters themselves having failed to reveal the cause, it was felt that there existed very strong grounds for serious investigation. It was subsequently discovered that owing to the vibration set up by a certain piece of machinery, one of the incoming leads to one of the meters periodically "earthed" to a piece of protruding metal. Previous tests applied to the wiring with a Megger over a week-end (when the machinery was idle) of course failed to reveal this, and the incident is quoted merely to show how, if only the one meter had been installed, the matter may have escaped detection indefinitely. The writer strongly advocates the use of tough rubber-sheathed cables of not less than 7/.036 for all such connections, making these as short as possible and using lugs to ensure good contact at the points of connection.

Tests have also been carried out with a view to determining the effects of changing wave form upon induction type meters, and while the writer has owing to lack of the necessary facilities been so far unable to deduce exactly to what degree the wave has been distorted from the true sine curve, he has succeeded by artificial means in bringing about a variety of conditions and changes.

The conclusion arrived at in respect of these tests is to the effect that the behaviour of the meter approximates very closely to that observed when testing for the effects of varying frequency, and it would be interesting if any of your readers could supply us with data of any similar tests they may have made under ideal conditions with the object of confirming this. In my opinion the question of price should always receive secondary consideration where energy is to be metered in any quantity, and more advantage should be taken of the capabilities of those engineers who specialise in this particular branch of the industry when schemes for metering such supplies are being mooted or carried into effect.

Meter Engineer.

December 14th, 1925.

All-Electric Houses.

With reference to Dr. S. Parker Smith's interesting paper on the "All Electric House" and the cost to run it, perhaps my experience over the past twelve years will help to popularise the use of electricity in the ordinary home.

I am connected to the Woolwich B.C.'s mains under a 4-year contract dated 1913 in the district of Eltham, Kent, and it is open to any householder to take up the same arrangement.

The terms are as follows:—£1 5s. less 20 per cent. per quarter for 434 units based on the wattage lamps connected when the house was wired. Any units over this amount per quarter, no matter for what purpose, whether heating, cooking, or lighting, are charged at 1d., less 20 per cent. The contract is also obtainable for 1, 2, 3, or 4 years at 5, 10, 15, or 20 per cent. respectively.

I use electricity for everything, with the exception of one coal fire in a large drawing room lit only in mid-winter, and a gas califont for hot water throughout the house.

The conservatory is warmed electrically by means of immersion heaters screwed into the bottom plugs of ordinary radiators. The bells are worked through a transformer off the mains and the number on the street door is done in Neon tube. The house is 7-roomed, with bath, &c.

The energy consumed and cost for the last three years are as follows:—1922, 8,532 u., £34 7s. 5d.; 1923, 9,797, £39 5s. 1d.; 1924, 6,661, £28 15s. 11d. There are two meters, but the readings are simply added.

I have induced several neighbours to adopt the contract, but they do not get the full benefit because they do not go far enough in the use of electricity. Several rooms have never been re-decorated since I entered the house.

I am often asked who supplies our meat; my answer is as follows: Take on electric cooking and never mind who the butcher is. Or, again, how do you manage to get such perfect toast, and the bacon done to a turn without being dried up?

I have found it very difficult to get householders to give consideration to the heating circuits in every room, and they dread the expense of the cooking apparatus and the handing-over to servants of the full care and charge of the various electrical apparatus in the kitchen.

They are full of admiration for the cleanliness and ease obtainable by using electrical appliances in the house. The final remark made to the wife is usually to the effect that "you see your husband is in the line."

B. J. Palmer.

London, *December 16th*, 1925.

The Risk of Lightning.—A survey made by Dr. A. W. Gilbert, Massachusetts Commissioner of Agriculture, shows that the chance of death by lightning in that State is only one in more than a million per annum. A man on the farm is 10½ times as likely to be struck by lightning as his city brother, due to the scarcity in rural communities of steel-framed buildings, trolley wires, &c.

National Health, Pensions and Unemployment Insurance.

By JOS. J. H. STANSFIELD.

THE Ministers of Health and Labour call attention to the changes in the rates of contributions for National Health and Pensions Insurance, and for Unemployment Insurance which come into effect from January 4th, 1926.

All persons insurable under the National Insurance Act are also insurable under the Widows', Orphans', and Old Age Contributory Pensions Act, 1925, and the contributions payable under both Acts will be paid on the same card by means of combined health and pensions stamps, cards being, as heretofore, issued to insured persons by their approved societies or obtainable from any Post Office. Employers must stamp the workers' cards for weeks of employment from January 4th, 1926, which date is the commencement of the first half-yearly period of 1926. Combined health and pensions insurance stamps of the values required will be purchaseable at any Post Office. As stocks of National Health and Unemployment Insurance stamps of the old denominations will be withdrawn from Post Offices after January 4th, it is essential that immediate steps should be taken to ensure that Health Insurance cards and Unemployment books are stamped up-to-date at the proper time.

In consequence of the new Act there have been substantial alterations in the weekly rates of contribution, and it may be of convenience to set out in detail the old and new rates.

RATES PAYABLE PRIOR TO JANUARY 4TH, 1926.

Health Insurance.—

	Total rate.	Employer's share.	Worker's share.
	d.	d.	d.
Men	10	5	5
Women	9	5	4
Exempt persons ...	5	5	—

If a worker aged 18 or upwards is not in receipt of board and lodging from the employer and the rate of remuneration does not exceed 4s. a working day the amount to be recovered will be less, as follows:—

(*a*) Where the wage is not over 3s. per day—

	d.	d.	d.
Men	10	10	—
Women	9	9	—

(*b*) Where the wage is over 3s. but not over 4s. per day—

	d.	d.	d.
Men	10	6	4
Women	9	6	3

Unemployment Insurance.—

	Total rate.	Employer's share.	Worker's share.
	s. d.	d.	d.
Men	1 7	10	9
Women	1 3	8	7
Boys, 16-18 ...	9½	5	4½
Girls ,, ...	8½	4½	4

In the case of exempt persons the employer is liable to pay the employer's share only.

RATES PAYABLE FROM JANUARY 4TH, 1926.

Health and Pensions.—

	Total rate.	Employer's share.	Worker's share.
	s. d.	d.	d.
Men	1 6	9	9
Women	1 1	7	6
Exempt persons—			
Men	11½	9	2½
Women	7	7	—

It will be noted that the new Act establishes the principle of a deduction in the case of exempt persons who are males.

A worker aged 18 and upwards under the circumstances before-mentioned pays a smaller contribution as follows:—

(*a*) Where the wage is not over 3s. per day—

	Total rate.	Employer's share.	Worker's share.
	s. d.	s. d.	d.
Men	1 6	1 1½	4½
Women	1 1	11	2

(*b*) Where the wage is over 3s., but not over 4s. per day:—

	s. d.	d.	d.
Men	1 6	10	8
Women	1 1	8	5

Unemployment—

	Total rate.	Employer's share.	Worker's share.
	s. d.	d.	d.
Men	1 3	8	7
Women	1 1	7	6
Boys, 16-18	7½	4	3½
Girls ,, ...	6½	3½	3

As before, in the case of exempt persons the employer will pay the employer's share only.

It will be seen that whilst there is a reduction in the rates for unemployment, there is an increase if health, pensions and unemployment are taken together.

Parliamentary News.

(By Our Special Parliamentary Reporter.)

The Horley Special Order.—Much discussion has recently taken place in the House of Lords on the Horley and District Electricity Special Order, 1925. On December 8th Lord Peel moved that the Order be approved, but Lord Clarendon moved an amendment to the effect that, "having regard to the decision of a Select Committee of this House upon the Horley District Gas Company (Electricity Supply) Bill, the Special Order be not approved." He explained that the Order was promoted by a small electricity company in the district of Horley, whereas the Gas Company's Bill would provide for a materially larger area. Other advantages of the Bill were that capital would be much more easily and more cheaply raised, dividends would be limited, and thus cheaper electricity could be generated. Further, the Gas Company would begin the electricity business with an established *clientèle*. The authorised capital of the electricity company was only £20,000, and the consulting engineer had guaranteed of this amount a total of £5,000 on the understanding that he was to secure a management agreement for seven years. The House of Commons Committee rejected the Gas Company's Bill, which had been passed by the Lords, but the company was again concentrating on that Bill. If the Order were rejected, he could promise the House that the Gas Company would promote a measure on the same lines next Session.

LORD GAINFORD urged the House to agree to the Order and not to deprive Horley of electricity. The Barking 800,000 h.p. station with its production up to 100,000 kW, had got adequate mains within four miles of the Horley area of supply. The Order would enable the Horley Electricity Company to become distributors. The district would then get electricity as cheaply as it could possibly be generated in this country.

In the course of further debate, LORD DONOUGHMORE, Chairman of Committees, suggested that the Order, and the new Bill, when introduced, should be referred to a Joint Committee of both Houses in the early spring.

Later, LORD SALISBURY, on behalf of the Government, suggested that the debate should be adjourned for a week in order that further consideration might be given to the matter. This was agreed to, and, on the resumption of the debate on December 15th, Lord Salisbury moved that the debate be further adjourned until the Special Orders Committee had reported whether any further Parliamentary inquiry was desirable before the House proceeded to a decision on the amendment, and, if so, what form that inquiry should take.

The motion was then agreed to, and the debate adjourned.

Electrification of Indian Barracks.—On December 14th, EARL WINTERTON informed Mr. Attlee that the question of the improvement of the barrack accommodation and amenities in India was one that had been engaging the close attention of the Secretary for India. As regarded electrification a large programme had been approved under which all barracks for British troops would eventually be electrified, and progress had been made annually. The Government of India was now considering what steps could be taken to accelerate the completion of that programme. According to the latest information received from the Government of India the barracks at Cawnpore had already been completely electrified.

Capitalisation of Industry.—On December 14th, Mr. ATTLEE asked the Prime Minister, whether, in view of the recent example of over capitalisation in the engineering industry, he would consider appointing a Royal Commission to inquire into the whole subject of the capitalisation of industry.

Mr. BALDWIN said that that was one of the subjects which was being considered by the Committee on Industry and Trade and he did not think the appointment of another body would serve any useful purpose.

Wireless in Ships.—On December 15th, in reply to Mr. W. Baker, SIR P. CUNLIFFE-LISTER said that the sailing of each boat without wireless operators was considered separately, and where compliance with the law was rendered impossible by operators declining to sail owing to a strike, and by this alone,

the ship was not detained. It would be impracticable to distinguish between different classes of ships and different classes of cargo.

Electrical Development.—On December 15th, Captain BOURNE asked the Minister of Transport if the report of the special commission appointed to inquire into and report upon the future development and control of electricity had yet been presented; if so, was he in a position to make any statement on the subject; and could he say whether it was proposed to publish the report.

Colonel ASHLEY said that he was not in a position to add anything to the previous statements which had been made to the effect that the report had been received and was under consideration.

Government Electricity Proposals.—On December 16th, Mr. R. MORRISON asked the Prime Minister if he was in a position to state whether the Government had come to a decision with reference to its electricity proposals.

Mr. BALDWIN said he was not yet in a position to make a statement on this subject.

Mr. SNOWDEN asked the Prime Minister whether he was aware that it was more than six months since he said that this important matter was receiving the attention of the Government, and that shortly after that the Minister of Transport said that the report of the committee of experts had been received and was receiving the attention of the Special Committee.

Mr. BALDWIN said all that was quite true, and he hoped to have a Bill ready for next Session, but the preparation of such a Bill and the examination of the points which would be raised required many months' work.

Electricity Orders.—In the House of Lords on December 16th, the Barnsley Corporation Electricity Extension Special Order, 1925; the Preston Corporation Electricity Extension Special Order, 1925; and the Blackburn, Burnley, and Clitheroe Rural Districts Electricity Special Order were approved.

Adjournment.—The House of Commons adjourned on Tuesday last, and will re-assemble early in February.

Trade-mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 16th. In the case of foreign applications, the names and addresses of the British representatives are also given.

Batwin (lettering and design). No. 463,709. Class 6. Electrical machinery.—Power Contracts, Ltd., 138-140, Southwark Street, S.E.1.

Ellipso. No. 460,597. Class 6. Electric fans.—Giljay Patents, Ltd., King's Road, Hay Mills, Birmingham.

Nuk (lettering and design). No. 449,325. Class 8. Radio-telephonic apparatus.—Neufeldt & Kuhnke, Kiel, Germany. (J. L. Hydeman & Co., 32, Queen Victoria Street, E.C.4.)

Ella-Varic. No. 461,076. Class 8. Radio-telegraphic apparatus.—George Kent, Ltd., 199-201, High Holborn, W.C.1.

Kathoxyd (lettering and design). No. 461,686. Class 8. Detectors for use in radio-telephony.—O. M. Seemann, 133, Wilhelmstrasse, Berlin. (Boult, Wade & Tennant, 112, Hatton Garden, E.C.1.)

Thothmic. No. 462,320. Class 8. Automatic telephones, telegraphic apparatus, &c.—A. H. Development Syndicate, Ltd., Iliffe Street, Walworth, S.E.17.

Nillos, No. 463,700, and Nonmic, No. 464,063. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—Igranic Electric Co., Ltd.

Sferavox. No. 462,973 and 462,974. All goods in Classes 8 and 9, and Sferophone, No. 462,976. All goods in Class 9.—Société Française Radio-Electrique, 79, Boulevard Haussmann, Paris. (Marks & Clark, 57-58, Lincoln's Inn Fields, W.C.2.)

Compactum. No. 463,900. Class 8. Instruments, apparatus and parts thereof for use in radio-telephony and telegraphy.—Edison Swan Electric Co., Ltd.

Trickle. No. 463,994. Class 4. Electrolytic rectifiers.—Radio Accessories, Ltd.

Employment and Wages.—Col. F. V. Willey, C.M.G., president of the Federation of British Industries, recently delivered an address to the Glasgow branch of the Federation In the course of this he referred to the fluctuations of the trade cycle—"booms" followed by periods of depression—and said that some attempt at scientific modification was necessary. There was a belief that larger units in industry should be considered as a means of decreasing working costs, instead of the lowering of wages. The rise in the value of the currency should have raised the real value of wages, but many factors, like the disproportion between sheltered and unsheltered trades, the result of internal distribution on social services, had retarded or prevented the normal economic process. It was therefore the more necessary to scrutinise other possible objects of attack before being finally forced to the course of wage reductions. The elimination of waste, the installation of more efficient machinery, and standardisation, would contribute largely to a saving in the national turnover. Col. Willey thought that payment by results, bonuses, &c., would stimulate the interest of the worker in his employment and would lead to a larger production. Higher earnings could often accompany a lower unit cost. Mentioning the growth of the deferred payment system in the United States, the speaker considered that it contributed towards an increase of commercial turnover and accelerated the improvement of the standard of living. Col. Willey also touched upon emigration, and said that there was a need for a bold Empire-settlement scheme which would develop the Empire and increase our trade.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

12,824. "Diaphragms and methods of vibrating the same applicable to the sound boxes of phonographs or the like." A. F. Sykes. May 24th, 1924. (Cognate application, 6,331/25.) (243,395.)

12,938. "Loud-speaking telephonic receivers." E. A. Graham. May 26th, 1924. (243,396.)

15,149. "Telegraph typewriters." Kleinschmidt Electric Co., Inc. August 11th, 1923. (220,280.)

17,528. "Employment of thermionic valve circuits." S. Brydon and D. B. Fletcher. July 22nd, 1924. (243,407.)

17,650. "Shock-absorbing devices for thermionic valves." Benjamin Electric, Ltd. September 17th, 1923. (222,086.)

18,183. "Method and apparatus for generating, relaying, rectifying, transforming, and amplifying alternating or pulsating currents." E. T. Fisk. August 9th, 1923. (220,297.)

20,038. "Frame aerials." W. Plumbridge and F. O. Helliwell. August 25th, 1924. (243,427.)

20,074. "Energisation and control of thermionic valves, particularly for use in wireless reception." Sabin Electrical Products Corporation. April 7th, 1924. (231,819.)

20,168. "Telephonic receivers." A. H. Midgley. August 26th, 1924. (243,431.)

20,169. "Adjustments for the magnets in telephone receivers and the like." A. H. Midgley. August 26th, 1924. (243,432.)

20,289. "Inductance coils." J. W. Combe. August 27th, 1924. (243,440.)

20,447. "Wireless direction-finding systems." R. T. Smith. August 29th, 1924. (243,448.)

20,448. "Wireless direction-finding systems." R. T. Smith. August 29th, 1924. (243,449.)

20,515. "Oil-immersed electric switches." A. Reyrolle & Co., Ltd., F. Coates, and J. Mirrey. August 30th, 1924. (243,452.)

20,607. "Means for eliminating magnetic coupling between coils." Hazeltine Corporation. April 7th, 1924. (231,820.)

21,143. "Electric lamps for illuminating motor-vehicle dash boards and for like purposes." D. McGregor. September 8th, 1924. (Cognate application, 1,944/25.) (243,467.)

21,312. "Electric switches." E. C. R. Marks (Hart Manufacturing Co.). September 9th, 1924. (243,471.)

24,428. "Terminal electrical connections suitable for the sparking plugs of internal-combustion engines." M. L. Williams. October 15th, 1924. (Addition to 160,375.) (243,493.)

25,394. "Gas detector for miners' electric safety lamps." A. G. Gulliford. October 25th, 1924. (243,496.)

25,664. "Telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). December 24th, 1923. (226,782.)

25,948. "Coil holders for wireless apparatus." W. S. Worthington. October 31st, 1924. (243,502.)

27,550. "Electromagnetic sound transmitters and receivers." British Thomson-Houston Co., Ltd., and J. Hutt. November 18th, 1924. (243,515.)

27,667. "Leading-in means for wireless aerials." A. H. Guinness. November 19th, 1924. (243,517.)

29,089. "Amplifying units for use in wireless systems." G. A. Mitchell. December 4th, 1924. (243,530.)

29,524. "Electrolyte for accumulators." V. L. Williams and L. L. Williams. December 9th, 1924. (243,537.)

29,545. "Automatic telephone systems and the like." Siemens Bros. and Co., Ltd., W. G. Patterson, and E. J. C. Rousseau. December 9th, 1924. (243,538.)

30,634. "Apparatus for the supervision and control of the stoppages and diminutions of speed of railway trains, tramways, and the like." E. Rodolausse. December 19th, 1924. (Addition to 162,617.) (243,547.)

31,158. "Electric hand lamps." National Carbon Co., Inc. December 26th, 1923. (226,840.)

1925.

1,187. "Illuminating appliances." W. A. Dorey. January 14th, 1925. (243,559.)

1,259. "Compensated asynchronous motors." Deutsche Werke Akt.-Ges. January 21st, 1924. (228,150.)

2,431. "Apparatus for improving the power factor in an electrical network." Akt.-Ges. Brown, Boveri et Cie. February 2nd, 1924. (228,546.)

3,352. "Electric terminal connection." S. W. Cole. February 6th, 1925. (243,571.)

6,636. "Squirrel-cage armatures for dynamo-electric machines." Deutsche Werke Akt.-Ges. March 25th, 1924. (231,462.)

9,046. "Compensated alternating-current machines." Sachsenwerk Licht- Und- Kraft-Akt.-Ges. April 4th, 1924. (231,895.)

10,486. "Receiving apparatus for high-frequency signals." British Thomson-Houston Co., Ltd. April 25th, 1924. (232,961.)

13,323. "Electrical variable condensers." G. Lombardi. December 10th, 1924. (243,618.)

13,598. "Sparking plugs for internal-combustion engines." A. Lang. May 24th, 1924. (234,522.)

14,631. "Single-axle bogies for rail and tramway cars." A. Kamp. May 28th, 1925. (Addition to 209,593.) (243,624.)

15,514. "Head-lamp control devices." G. H. Soldani. June 15th, 1925. (243,631.)

16,776. "Glass bulbs for electric incandescent lamps or the like and a process for repairing them." Naamlooze Vennootschap Philips Gloeilampenfabrieken. July 23rd, 1924. (237,579.)

17,659. "Variable resistors." A. K. Croad (Amsco Products Inc.). July 9th, 1925. (243,278.)

19,469. "Supports for lamps, particularly for use in street lighting." Benjamin Electric, Ltd., and R. A. Ives. July 31st, 1925. (243,646.)

18,491. "Electrolytic separation of metallic chromium." E. Liebreich. July 21st, 1924. (237,288.)

18,956. "Protective relays." British Thomson-Houston Co., Ltd. August 8th, 1924. (239,216.)

20,266. "Thermionic amplifying apparatus." British Thomson-Houston Co., Ltd. August 15th, 1924. (238,550.)

21,381. "Tanks for electrical transformers and the like." Metropolitan-Vickers Electrical Co., Ltd. September 10th, 1924. (239,845.)

22,150. "Electric discharge devices and means for operating the same." British Thomson-Houston Co., Ltd. September 18th, 1924. (240,149.)

22,757. "Toy electric lamp." I. M. Bennett. September 11th, 1925. (243,291.)

25,247. "Filament supports for vacuum tubes." British Thomson-Houston Co., Ltd. October 9th, 1924. (241,215.)